SEPTEMBER 20, 1957

electronics

business edition

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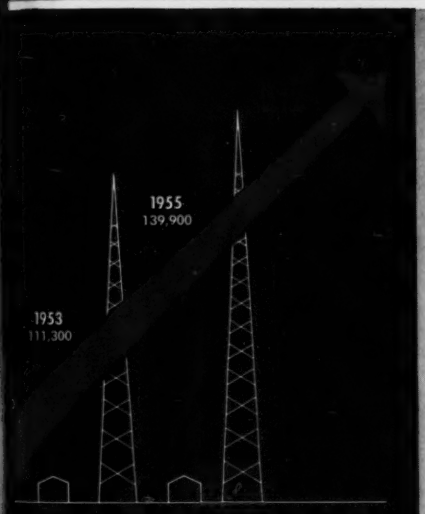

GROWTH OF AMATEUR RADIO

Special Report: Amateur Radio

Survey finds $23-million annual market growing 20-percent each year . . p 24A

Tracking Down Interference

Designers and users join FCC in drive on man-made noise . . . p 13

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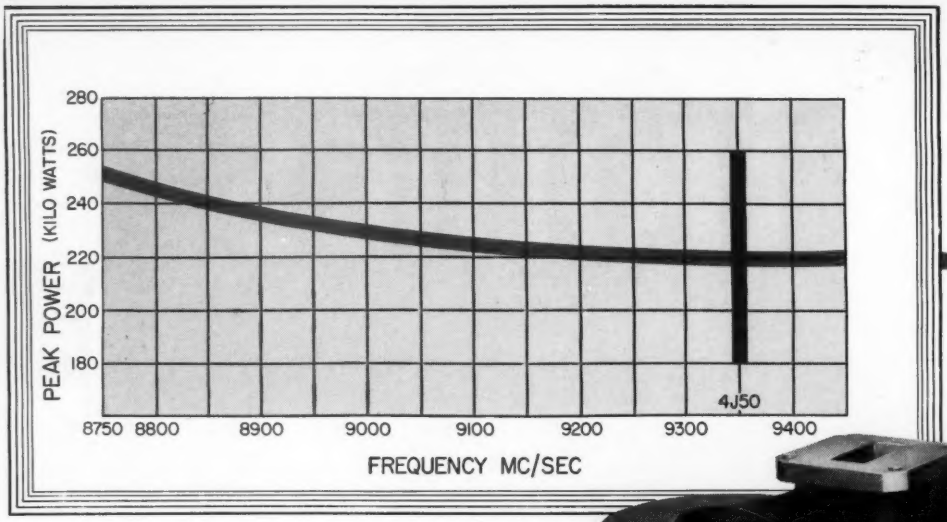


Average peak power output vs. frequency for Sylvania magnetron type 6874 compared with fixed frequency type 4J50

Sylvania duplicates the power and package of the 4J50 in a...

Tunable Magnetron

Type 6874

Adds flexibility to existing equipment as well as to new designs

Sylvania sets the pace in magnetrons with its newest, high-powered tunable unit, type 6874, that covers the frequency range between 8800 and 9400 Mc. The tunable 6874 directly replaces the fixed frequency 4J50 magnetron. It provides rapid and inexpensive conversion of fixed frequency systems to meet latest military requirements.

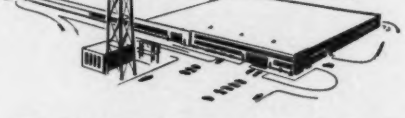
Designed for airborne radar and missile applications, the 6874 is mechanically ruggedized for severe shock and vibration requirements. Thus a very compact tunable package is provided even for very severe environmental conditions.

Typical Characteristics:

Heater Voltage (Preheat)	13.75 Volts
Heater Current	3.00—3.75 Amps
Peak Anode Current	27.5 Amps
Peak Power Output	200 KW nominal
Peak Anode Voltage	21 KV
Pulse Duration	1.0 u sec (3.34 sec max)
Duty Cycle	.001

Sylvania moves ahead in Magnetrons

With tripled magnetron production facilities now in operation at its Williamsport, Pa., plant, Sylvania meets expanding military and commercial needs. Call your Sylvania representative for full information on the complete Sylvania magnetron line.



Sylvania's Williamsport, Pa., plant houses expanded magnetron production facilities

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electronics business edition

A McGRAW-HILL PUBLICATION • VOL. 30, NO. 9B • SEPTEMBER 20, 1957

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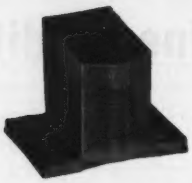
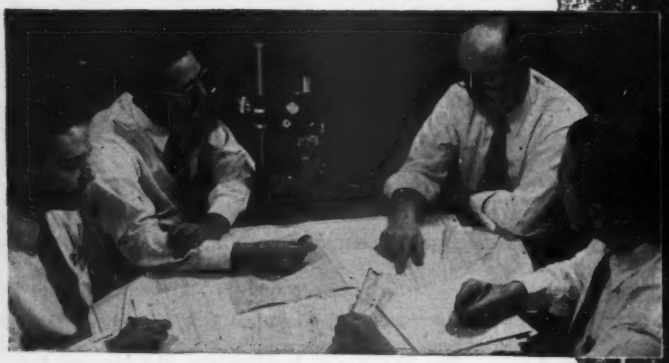
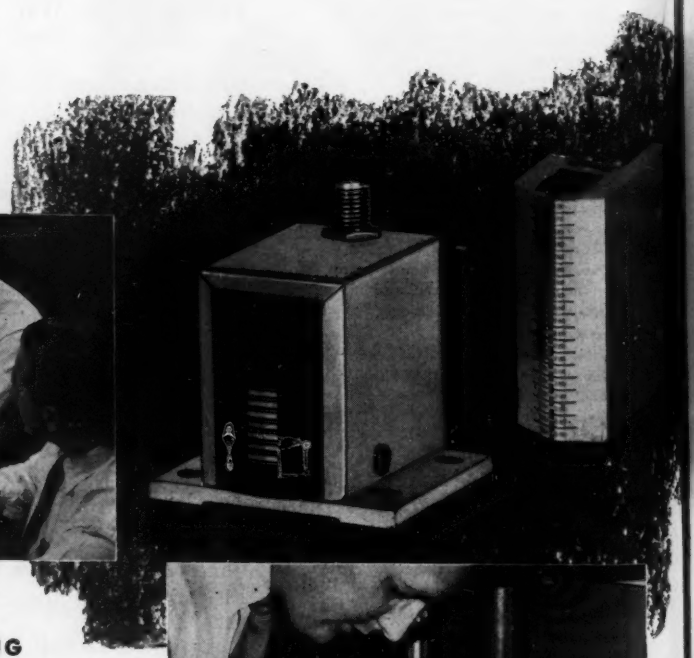


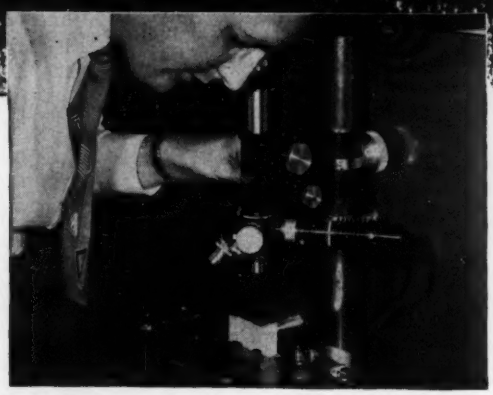
3 reasons to call on Brush for complete service in magnetic heads





1 EXPERIENCED DESIGN ENGINEERING

Brush's engineering group is equipped to start with your basic requirements—carry on with complete development and design. The same broad design concepts, materials and processes which have been applied so successfully throughout the years to thousands of heads now can be used to meet your own requirements, whatever they may be.



2 UNMATCHED PRODUCTION FACILITIES

Brush is the largest commercial source of magnetic heads, offers both the physical facilities and manufacturing know-how for any type of head you may have in mind. Brush facilities assure quality workmanship plus on-time deliveries.

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Debentures Popular

Nine out of 19 firms used convertible debentures or preferred to raise $66.7 million in first half

CONVERTIBLE securities, giving buyers immediate income plus prospects for sharing in industry growth, were popular among public offerings of electronics companies in the first six months of this year.

Nine out of nineteen issues with a total issue value of $66.7 million carried common stock conversion privileges. Six were convertible debentures with a total value of $44.7 million. Three were convertible debentures with a total value of $12.0 million.

All electronics firm issues in the period totaled $300 million. But, the huge IBM issue of $231 million accounted for the bulk of common offerings.

In addition about $27 million was raised by 11 firms through private placement.

SECURITY OFFERINGS, JAN.–JULY 1957

Company	Value	Description	Underwriter or Lender
American Electronics	$2,090,000	190,000 shs common	Van Alstyne, Noel & Co.
American Machine & Foundry	12,725,800	5% conv sub. debentures	Eastman Dillon, Union Securities & Co.
Applied Physics Corp	296,000	32,000 shs common	Schwabacker & Co.
Collins Radio	7,917,000	5% conv. sub. debentures	Kidder, Peabody & Co.
Daystrom	8,000,000	4 3/4% conv. debentures	Goldman, Sachs & Co.
Erie Resistor	1,500,000	100,000 shs 6% conv. pref.	Fulton Reid & Co., Inc.
Fischer & Porter	3,200,000	4 1/4% conv. debentures	Hallowell, Sulzberger & Co.
General Precision Equip	9,710,000	194,200 shs 6% conv. pref.	First Boston Corp.
Herold Radio & Electronics	800,000	160,000 shs 6% conv. pref.	Amos Treat & Co.
I B M	231,049,060	1,050,223 shs common	Morgan Stanley & Co.
I–T–E Circuit Breaker	10,000,000	4 1/4% conv. debentures	Smith, Barney & Co.
Magnetic Amplifiers	292,500	90,000 shs common	D. A. Lomasney & Co.
Manning, Maxwell & Moore	1,499,190	71,390 shs common	Clark, Dodge & Co.
Microwave Associates	350,000	50,000 shs common	Lehman Brothers
Midwestern Instrument	1,000,000	200,000 shs common	C. E. Unterberg, Towbin Co.
Radiation, Inc.	2,232,384	186,032 shs common	Johnson, Lane Space & Co.
Security Electronics	263,750	263,750 shs common	Foster-Mann Inc.
Topp Industries	2,750,000	6% conv. sub. debentures	Dempsey-Tegeler & Co.
Universal Transistor Products	300,000	150,000 shs common	Milton D. Blauner & Co., Inc.

PRIVATE PLACEMENTS, JAN.–JULY 1957

American Machine & Foundry	$1,000,000	4 3/4% notes	Bankers Life of Nebraska and others
Applied Science of Princeton	900,000	30,000 shs common	Clark Dodge & Co.
Communications Accessories	650,000	5 1/4% guaranteed notes	New York Life Insurance
Consolidated Electrodynamics	4,300,000	100,000 shs common	Blyth & Co., Bache & Co.
El-Tronics Inc.	152,601	105,334 shs common	(Six institutions)
General Transistor	400,000	5 1/2% conv. sub. notes	Kidder, Peabody & Co.
" "	193,500	18,000 shs common	" " "
Gulton Industries	1,400,000	100,000 shs common	Wertheim & Co.
Magnavox	6,000,000	4 1/4% notes	New England Mutual Life & one other
Siegler Corp.	4,000,000	5 1/8% senior notes	New England Mutual and Prudential Life
" "	500,000	5 1/2% junior conv. notes	New England Mutual Life
Sylvania Electric Products	6,000,000	4 5/8% debentures	Life Insurance Co. of Virginia and others
Tele-Dynamics Inc	700,000	5 1/2% notes	Fidelity Mutual Life Insurance

SHARES and PRICES

MAGNETIC RECORDING TAPE market at present is $14 million, according to a study on Audio Devices, Inc. by Clark, Dodge & Co., New York investment firm. The study did not include military instrumentation tape.

Current use is primarily in sound recording for home, radio, educational and church use.

New and expanded usage in television, computer operation and in the home are keys to future.

Typical Magnetic Recording Tape Manufacturers	Recent Price	Dividend Rate	Percent Yield	Earned per Com. Share 1957	Earned per Com. Share 1957	Traded	1957 Price Range
Ampex	51¾ [1]	....	....	1.51 (yr) [3]	0.58 [3]	OTC	.....
Burroughs	46¾	....	....	0.53 (3 mos)	2.35	NYSE	33⅞–52⅜
Audio Devices	8⅝	0.05	0.1	0.25 (6 mos) [4]	0.33	ASE	4⅞–9¾
Minnesota Mining & Mfg.	90½	1.20	1.3	0.58 (3 mos)	2.30	NYSE	58–101
RCA	35	1.50	4.3	1.35 (6 mos)	2.65	NYSE	31⅜–40
Reeves Soundcraft	1⅞ [1]	.....	....	0.03 (3 mos)	....	OTC	.....

[1] bid [2] indicated [3] fiscal year [4] estimated

Mergers Still High

Activity in first half of 1957 about equal to last year

Economists estimate mergers and acquisitions in 1957 will total nearly 1,000.

The Federal Trade Commission recently reported that 462 mergers occurred in the first six months of 1957 compared with 466 in the first half of last year. There were a total of 905 mergers for the year in 1956 and 846 in 1955.

Among electrical and electronic manufacturers there were 70 mergers last year, or 7.3 percent of the total. In 1955 there were 53 or 6.3 percent of the total.

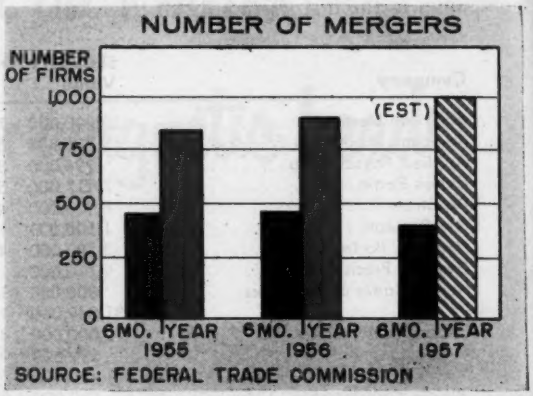
For many in our industry merger is the main road to growth; the most attractive method of selling out, and important in preparing for date of estate settlement.

The total number of electronic firms which have been partner to merger agreements is undoubtedly much greater than 70.

The FTC figures reflect the merger trend. But, they do not include every merger that occurs. The FTC compiles its merger totals from reports in financial manuals and newspapers. It misses many mergers not reported in these sources.

This lack of complete information is one of the reasons for the bill now before Congress requiring advance notification of merger plans.

Regulatory agencies, besides wanting a count down, want to be in a position to take action to prevent mergers of which they do not approve before consummation.



MERGERS, ACQUISITIONS and FINANCE

• **Automation Shares, Inc.** of Washington D. C. gets its first public offering underway. This open-end mutual fund was organized to invest in companies manufacturing, renting and installing automation devices and equipment. Investment policies are geared to take advantage of the steadily expanding demand for goods and services. Herbert W. Robinson, former assistant to Lord Cherwell, personal scientific and statistical adviser to Prime Minister Churchill, is president of the automation fund.

• **Servomechanisms** of New York City acquires rights to an evaporation technique for deposit of metals on electronic components from **Silver Plastics Corp.,** El Segundo, Calif. Gordon Steele, former president of Silver Plastics, joins Servomechanism's research staff.

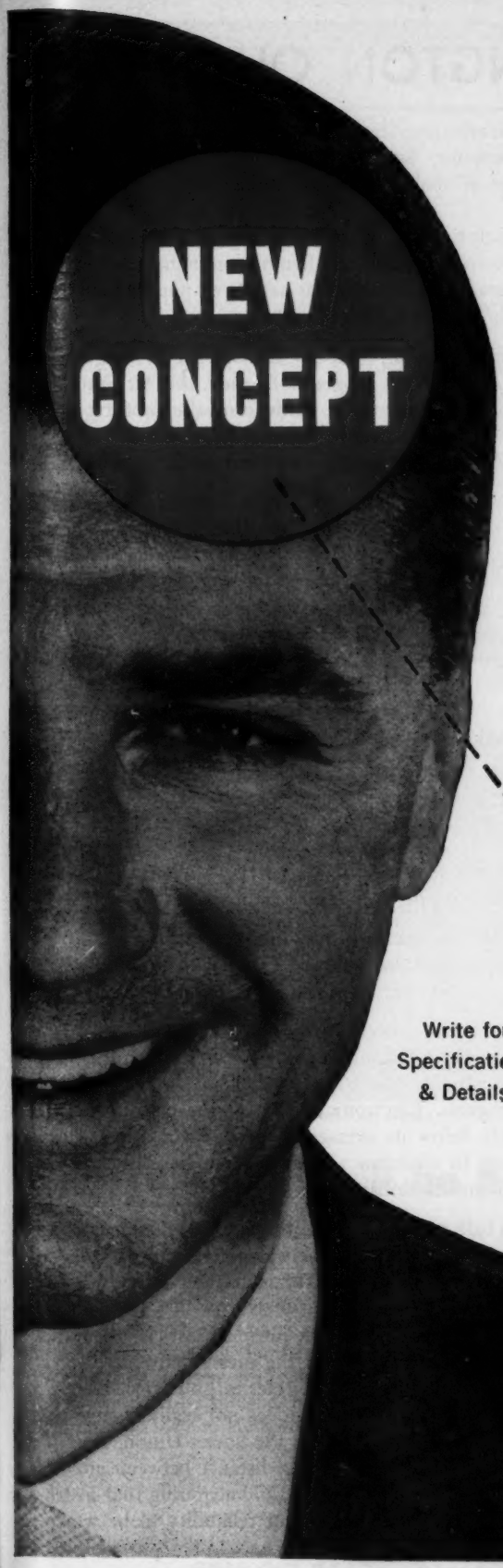
• **Statham Instruments, Ltd.,** Los Angeles, Calif., plans to offer 200,000 shares of common stock. Half of issue will be for account of the company and half for nine stockholders, including company president, Louis D. Statham. Proceeds will be used to build a new plant in LA which will replace five separate LA plant locations now in use. Blyth & Co. will be the principal underwriter.

• **Chicago Aerial Industries,** Melrose Park, Ill. is revamping its corporate setup with the establishment of a components division at Franklin Park, Ill. The new division will be ready for operation in September upon completion of a new plant. The first products will be a line of ultraprecision potentiometers. Production of potentiometers for high temperature applications in missiles and related fields is planned for the future.

• **General Dynamics'** plans for merger with **Liquid Carbonic** approved by directors of both companies. Merger will be submitted for shareholder approval next week. Proposed agreement calls for Liquid Carbonic shareholders to receive one share of General Dynamics for each share held. The merged firm will become the Liquid Carbonic division of General Dynamics. The merger is one step in GD's policy of broadening its base of operations in the commercial field.

• **Aircraft Radio** of Boonton, N. J. sells $1.6 million of long-term notes to Prudential Insurance Company. With the notes go 10,000 warrants to purchase Aircraft common at $3 above the market price as of Sept. 3. The stock was then quoted at 21¾-23⅜ over the counter. Notes mature in 1972 and repayment begins in 1962. Proceeds will be used to refund short-term obligations.

• **Amphenol Electronics,** of Chicago issues 200,000 shares of common stock at $27.50 per share. Proceeds will be used for expansion of facilities and to purchase **Danbury-Knudsen, Inc.** This firm, located in Danbury, Conn., manufactures connectors and miscellaneous electronic specialties. Its acquisition will give Amphenol East Coast manufacturing and distributing facilities. Hornblower & Weeks heads the underwriting group.



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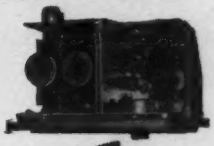
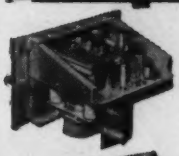
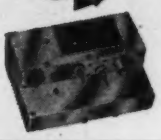


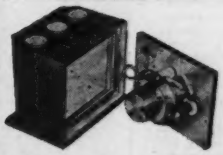
Model 1462—6" x 4¼" x 3⅜"
50 to 80 Watts



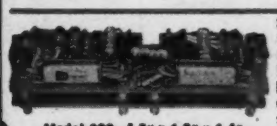
Model 1463—5 1/32" x 3 3/16" x 4"
15 to 30 Watts



Model 1472—4" x 1.5" x 2.7"
2 Watts



Model 1480—5" x 4⅝" x 3 1/16"
RF Amplifier
15 to 30 Watts



Model 800—4.5" x 1.3" x 1.4"

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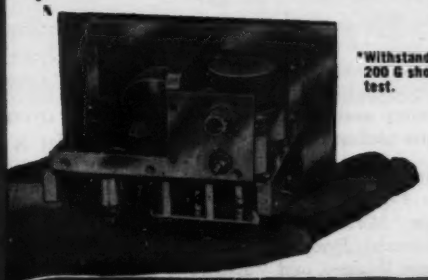

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WASHINGTON OUTLOOK

AN IMPORTANT shift in administration policy on ballistic missile development is quietly shaping up. Some officials refer to it as a "program adjustment," others as a "shakedown." In essence, it's a basic change in attitude.

Up to now, Washington has considered the long-range ballistic missile program—in which electronics producers figure prominently—something of a sacred cow, a program in which billions have been poured with little regard for budget ceilings or other fiscal controls.

But now, the Pentagon is taking what one Defense Dept. budget man calls "a more realistic look" at the program. Already, the Air Force has been ordered to reduce procurement of ballistic missile prototypes for test launchings. Production plans for the Air Force's Titan ICBM project are being whittled down and development goals stretched out.

Among the electronic contractors on Titan, a competing project to the Atlas ICBM, are: American Bosch Arma, inertial guidance; Bell Labs, ground-based radar; and Sperry Rand, computation facilities.

In addition, funds have been reduced some for the Navy's ship-launched Polaris IRBM; General Electric, Westinghouse and Interstate Electronic Corp. are among the electronics subcontractors on this project.

In part, this change from an open-purse policy for the big missiles to one of more restrictive budget controls reflects the general Defense Dept. economy drive. But in part the change is characteristic of what normally happens when the costly hardware stage of a massive R&D program is reached—a more careful selection of components is made; development effort is concentrated on fewer contractors; the more marginal projects are weeded out.

The upcoming decision on cancelling one or merging the competing Air Force Thor and Army Jupiter IRBM projects, or course, falls into this new ballistic missile pattern.

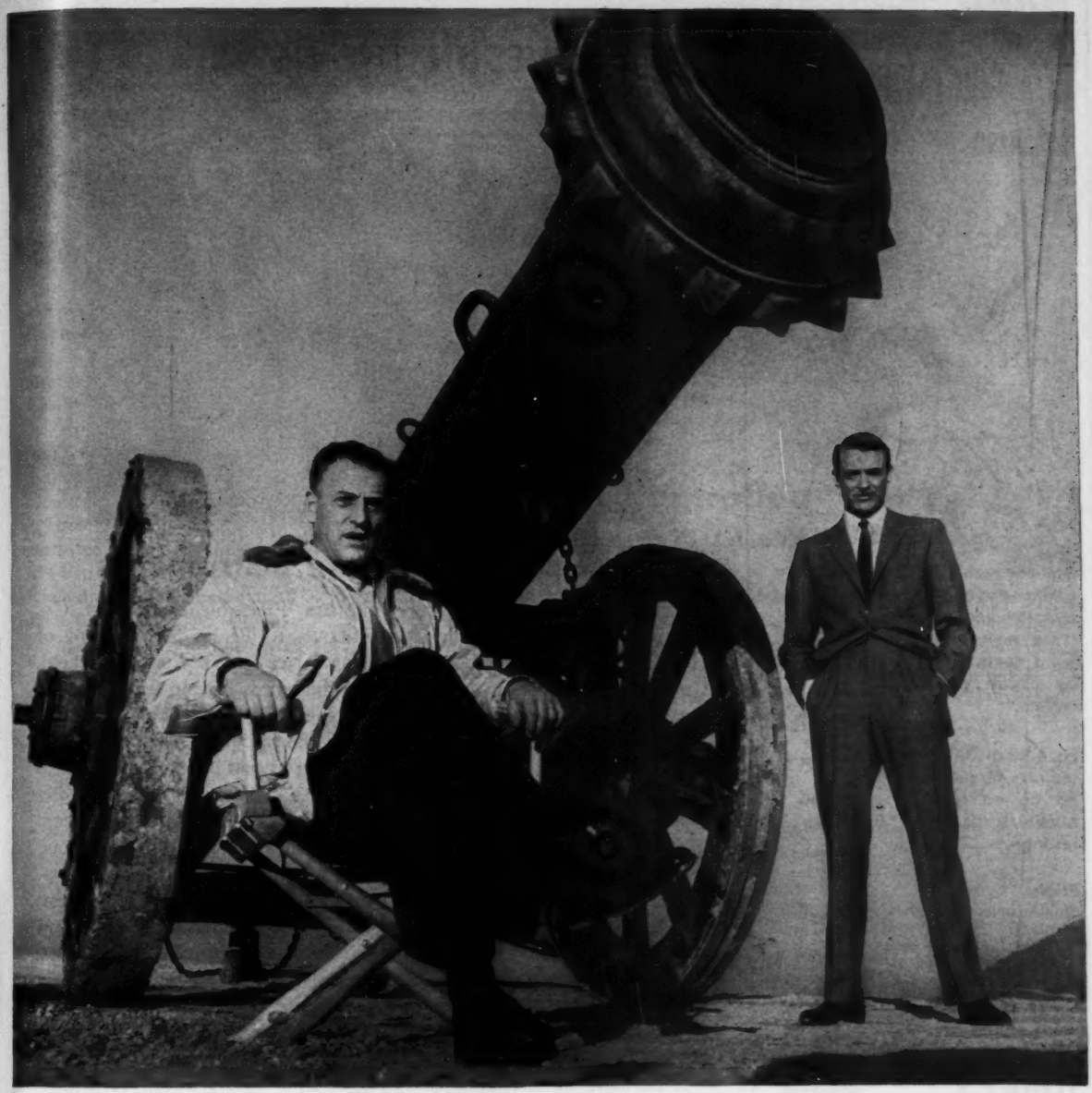
Total expenditures on strategic ballistic missiles will probably hit at least $1 billion in fiscal 1958. That's some $250 million over last year's sum. Both figures are far beyond initial cost estimates.

Indeed, ballistic missiles have been a major factor in the Pentagon's underestimate of over $2 billion in total defense spending for fiscal 1957 and 1958. This underestimate has in turn prompted the cutbacks in the overall military program. Electronics' share of the ballistic missile dollar is proportionately below its average 50 percent for missiles as a whole; the chunk going to electronics firms is more likely around 25 percent of the ballistic-missile dollar.

● **The switch** on ballistic missiles is being called at an embarrassing time for Washington. It comes in the wake of the recent Russian claim of a "successful test launching" of an ICBM—something the U. S. has not been able to achieve.

Russia's announcement stirred up a storm of criticism—notably from Senate Democrats and much of the press—that the U. S. is lagging badly behind the Russians in the race for an ICBM. Defense officials believe that the Soviet success does not really change the relative military power of the U. S. and the Soviet Union.

Pres. Eisenhower said, "There is a long distance between proving that you can fire one test instrument . . . and acquiring that instrument in sufficient numbers and sufficient reliability to be worthwhile tactically."



Stanley Kramer, Producer-Director, and star Cary Grant tell why:

"This shot will be heard around the world!"

"To shoot 'The Pride and the Passion' in Vista Vision and Technicolor — on location in Spain — was an enormous job. We lugged this 40-foot cannon over mountains — with the help of Frank Sinatra, Sophia Loren, and thousands of extras!

"It was tough work and a tough shooting schedule to meet United Artists' release date for the film!

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"We count on Air Express to pick up the cans of film in New York, rush them to Hollywood for processing and cutting, fly them back for top executive screening.

"Then Air Express beats the release date by delivering hundreds of prints throughout the U. S. They speed up ground time with radio-controlled trucks — and even 'keep an eye on' all the shipments with their private teletype system!

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EXECUTIVES IN THE NEWS

Ripley*: prize cows and instruments

NEW skipper at the helm of Waltham Precision Instrument Co. (formerly Waltham Watch Co.) is Louis R. Ripley, ex-president of Heli-Coil Corp. Ripley is 52, a confirmed Yankee from Litchfield, Conn., and "a doer, an organizer," in the words of one key associate. He takes over the 107-year-old Massachusetts watchmaking firm at a time when it needs just what he has to offer.

Waltham was sliding downhill until its recent diversification into the miniature instrument field. Ripley has been busy lately reversing that slide. What had been a stagnant organization—"there were niches and corners nobody'd even looked into for 17 years," says one Walthamite—is today getting a stiff dose of self-confident determination.

The man who's working this change took a degree in business administration from Babson Institute in 1927. He has since backed it up with practical studies in finance and technology. He worked for three years in Wall Street, left in 1932 to travel abroad studying aircraft and airline organization. In the mid-thirties he organized an electronic controls firm, United Cinephone Corp., of which he was president until 1946. Cinephone made the ST/100 radar test gear for the B-29.

A big farm in Litchfield serves Ripley as a "safety valve," gives him what he calls a "change in chemistry." Countess, one of his herd of prize Brown Swiss cattle, this year broke all records for milk production.

Right now, Ripley keeps bachelor quarters in Waltham. His wife and five children (oldest 11) are still in Litchfield. Since he frequently works until 9 p.m.—and sometimes drags on until the small hours—he intends to keep the farm as a safety valve even if he gets to it only on weekends.

* With WPI chief engineer William Young

STRICTLY PERSONAL

Profits Shared

We have read with interest the story "Profit Sharing Grows Popular" (Aug. 10, p 26), and especially the last paragraph, in which it is said that none of the electronics industry's profit-sharing systems has been functioning long enough for retiring workers to get into the real money yet.

We have a profit-sharing trust

of the type described in effect since 1943; and since that time a good many employees have retired to benefit by it in rather a big way.

A. E. Thiessen
General Radio Co.
Cambridge 39, Mass.

Profits Up

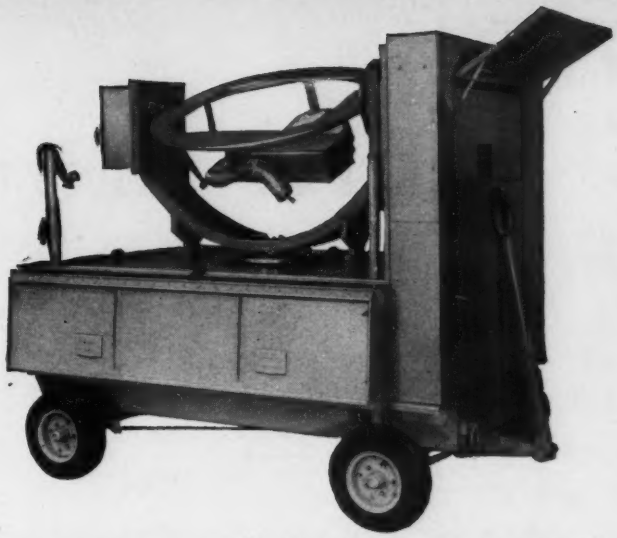
In your financial roundup (Aug. 20, p 5) you have an article which emphasizes the improvement in sales and profits for the electronics industry during the first half of '57. Raytheon's results provide an excellent example of this happy situation. Unfortunately, we were left out of the list showing sales and profits comparisons.

Under "Shares and Prices" we are listed, with a footnote, showing 63¢ earned per share in ten months "including seven months of 1956." Prior to this year, we were on a fiscal-year basis which ended May 31. Last year, in order to get on a calendar-year basis, we published a short "annual report" for the seven months from June 1 through Dec. 31. Our per-share earnings for year ended May 31, 1956, were 45¢; for the seven months ended Dec. 31, 1956, 23¢; and for the six months ended last June 30, 81¢. As you can see, during the first six months of 1957 Raytheon's earnings were better than 3½ times those of the last seven months of 1956, and almost double the fiscal year ended May 31, 1956.

The true picture of Raytheon's improved earnings is not reflected in your listing of 63¢ for ten months, because it is a composite of only three months of this year with seven "depressed" months of last year. Actually, it would have been better for us if your financial editor had listed just three months' earnings for us (40¢), as he did for others.

Raytheon has been one of the most actively traded stocks on the New York Stock Exchange since the publication of our six-months report. We are naturally proud of Raytheon's progress, and anxious to have the picture properly understood.

Richard P. Axten
Raytheon Mfg. Co.
Waltham, Mass.



New servo-controlled "Tilt Table" for missile guidance testing

This Thompson-engineered mobile unit aids in the functional check of an intercontinental missile's internal guidance gyroscopes. It generates angular position and velocity inputs to the gyros. Unit consists of electro-mechanical assembly, electronic pre-amplifiers and pick-off amplifiers, and quadrature rejection unit. Two-gimbled support structure will carry a 125-lb. guidance package.

New Actuator operates for 100 hours at 550°F submerged in jet fuel

Pictured is a new Thompson-developed actuator used in missiles. It consists of motor, gearing, feed-back pick-off and jacket. Unit has been tested for 100 hours of operation at 550°F submerged in jet fuel. Power output is 10 watts (mechanical). Torque output is 150 inch-ounces at 30 rpm at 550°F. Servo performance in conjunction with a computor produces a positional accuracy of ±½ degree. Approximate size: 3″ diameter x 4″.

Call on Thompson for development and production of electronic control sub-systems and components, countermeasures and microwave components. We invite your inquiries.

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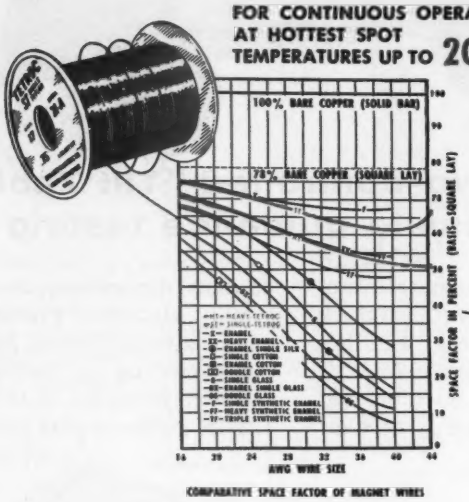

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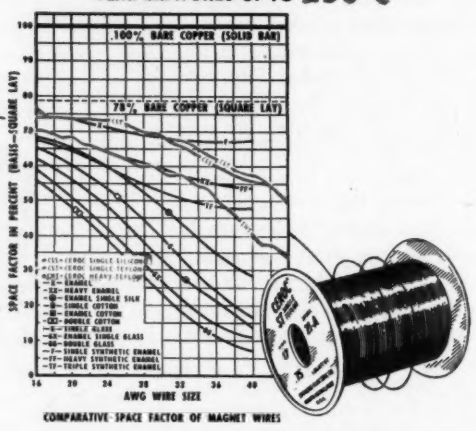

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electronics
business edition

SEPTEMBER 20, 1957

Jet-starting power supply is checked for RI . . .

Tracking Down Interference

More firms, people are battling fast-spreading problem of spurious electromagnetic energy, but fight's far from won. Solution is seen in better equipment design with byproducts of greater reliability, longer life, improved performance and less maintenance

A GUIDED missile blows up. Another plunges wildly into the desert. Still another careens into the jungle. Exact cause: undisclosed. Possible cause: radio interference (RI).

Radio interference bothers more than missiles. It has been known to explode flash bulbs in airliners, set off a grounded fighter plane's rockets, detonate dynamite charges in blasting projects.

Not too long ago, test pilots refused to fly certain planes. RI threw off communications equipment, totally destroying their home-base contact.

Today radio interference (spurious electromagnetic radiation) is 10 times worse than it was 10 years ago. Use of more electrical and electronic equipment in general is helping to increase it.

More home electrical equipment in particular is adding to the radiation, both when new and after deteriorating. Offenders include arcing commutators on motorized appliances, electrical contacts on automatic cycling devices (washing machines, dryers), reducing machines and various types of vibrators.

Ironically, harm to electronic equipment is caused far more by electrical equipment than by other electronic equipment.

Efforts to combat RI are coming from a number of directions. The armed forces are active. IRE is participating. Some firms have or are installing special departments.

Combating RI is costly. A typical screen room costs about $4,000. Test equipment to handle the range from 14 kc to 10,000 mc (usually five instruments) costs about $41,000. Thus, a firm planning to install a screen room meeting military specifications can figure on spending about $50,000 for bare essentials.

At least 10 private firms are in the interference business handling outside jobs. Average rates fall between $15 and $25 per hour. These include cost of screen room and one operator.

Cooperative Interference Committees, dedicated

Belt-worn untuned detector is used by FCC to locate source of interference

to finding and suppressing or reducing interference, are increasing. The CIC's were pioneered in Los Angeles three years ago. Made up of volunteers, CIC's help the FCC and other organizations fighting radio interference.

Also functioning in the area is the RITC—Radio Interference Technical Committee. Almost two years old, it's also composed of volunteers from industry. Aims: educate, exchange information, assist anyone concerned with RI control, advance the science of interference control.

Some foreign nations are ahead of the United States in controlling RI. Overseas, controls are set by government bureaus. If manufacturers don't comply, they can't sell their equipment.

U.S. limits are set forth, in length, in Parts 15 and 18 of the FCC rules. The limits vary according to the type of equipment generating r-f energy and the frequency involved. (Copies of the rules, and FCC bulletins on interference, are available from Superintendent of Documents, G.P.O., Washington 25, D.C.)

The FCC requires type approval for certain models of equipment and engineering certification for other installations. When there's a threat to safety services (police, fire, aviation), the agency goes out after interference immediately.

The Navy Department's L. W. Thomas, Bureau of Ships, points out to the electronics industry that the best approach to the RI problem is in basic design. He says interference-free design results in greater reliability, improved performance, longer life and less maintenance.

Costwise, it is less expensive to design properly than to apply filters, capacitors, and other interference-suppression devices after equipment has been built.

Case histories show that redesigning may actually cut costs. In one instance, the price of an ordnance equipment actuator was slashed from $76 to $39. And on one large radar job, redesigning and cleaning up to prevent radiation saved $2 million in costs for the production run.

Rexford Daniels, president, Interference Testing and Research Lab, offers another thought: "Start giving interference courses in colleges and technical schools. This way, new engineers will know the problems and how to deal with them. More vital, they will save their employers much time and money."

In the fight against RI, leaders say two other things must be done: check equipment more often for deterioration; maintain it better.

RI from safety-valve motor used in jet fighters is checked by AiResearch technician with stethoscope-like apparatus including probe, amplifier and earphones

Medical Gear Comes High

• Cancer-detecting machine installed for Public Health Service underscores the time and money needed for just a protoype model

• Instrument faces Memphis trial in cancer of uterus detection; Second unit goes to Sloan-Kettering next month

How can a machine recognize a cell and decide if it is cancerous?

It took one company five years and about $350,000 worth of research grants and private investment to get the answers and then build two pieces of prototype apparatus. That's the nature of a large segment of medical electronics today.

Last month Airborne Instruments Laboratory got over one big R&D hump as cancer researchers of the U. S. Public Health Service hopefully readied AIL's first Cytoanalyzer protoype for cancer detection. It was installed at the University of Tennessee in Memphis.

Next month a second machine will be installed at New York's Sloan-Kettering Institute for Cancer Research, which provided grants for its development, along with the National Cancer Institute and the American Cancer Society.

In Memphis the Cytoanalyzer will at first be compared with the slow visual method of telling cancerous from normal cells of the uterus. Cancer of the uterus, second largest cause of cancer deaths in women, annually strikes 50,000 and kills 15,000.

Effective means now are available for detecting uterine cancer by cell examination, says Surgeon General Leroy E. Burney of the Public Health Service. But, he adds, "we are faced with a scarcity of technicians to analyze the test results."

That's where the Cytoanalyzer with its scanning microscope, computer and high speed data handling comes in. Medical researchers feel the machine will speed examinations of thousands of cell samplings by microscopically scanning slides and instantly screening out those containing abnormal cells.

More cures would then be possible because most cases of uterine cancer can be cured if the disease is diagnosed early.

Eventually, four more centers will be set up to develop use of electronic cell examinations for detecting cancer of the lung, large intestine, stomach, prostate and urinary tract.

"If the Cytoanalyzer proves a success in detecting

TECHNICAL DIGEST

• **How many plays?** Life of new phonograph record material can be measured electronically by molding special test record, then measuring its intermodulation distortion and other characteristics at intervals of 25 plays. Optimum molding conditions can be similarly determined. Technique has resulted in records withstanding up to 1,000 plays, whereas 100 plays is considered satisfactory by most manufacturers. Test record includes 1,000-cps band, intermodulation grooves, silent band, 3,000 to 5,000 cps harmonic distortion grooves and short hi-fi musical selection.

• **Not all sunspots** are bad for radio, according to RCA propagation analyst John H. Nelson. Good sunspots, fortunately in the majority, stabilize reflecting layers of ionosphere and thereby minimize fading. Effect of planets on sun is now known, so that radio weather can be predicted for years ahead with better than 90 percent accuracy. Expected ionospheric disturbances can generally be offset by changing routes or frequencies on transoceanic radio links.

• **Cadmium sulfide** is heart of infrared-sensitive cell used in Navy's Sidewinder guided missile. In Hoffman Labs' demonstration, this cell responded to match lighted 50 feet away.

• **Noisy air conditioners** are spotted in one factory by running the production-line conveyor through an acoustic test cell and recording on paper the entire noise spectrogram from 20 to 20,000 cps. When a curve crosses the go-no-go limit established for the unit, frequency of noise peak generally identifies source of trouble. Thus, 180-cps peak means rotor unbalance and 2,500 cps peak means bad fan blade. Test equipment includes Bruel & Kjaer a-f spectrometer, and level recorder and capacitor microphone.

• **Both radar reflector** and radome are flexible and inflatable in new portable ground radar developed by Westinghouse for USAF. Reflector consists of two 50-ft high paraboloids formed of vinyl glass fabric, with a 30 by 20-ft metallized Mylar film bonded to the inside of one. When attached to antenna base and inflated, fabric stiffens to give required curved reflecting surface for horn feed of radar.

uterine cancer," says National Cancer Institute director Dr. John R. Heller, "it is likely it also can aid cancer detection in these other sites."

How much will such a machine cost? There's no answer yet because there has been no real production of this type of heavy medical electronic gear.

But computer functions require bigger spending by medical people than they have been accustomed to, says Walter E. Tolles, head of AIL's medical and biological physics department.

"Most doctors think in terms of $500 to $5,000 machines," he says. "But when you get into computing and data handling, you are talking about much more expensive equipment."

Some 60 percent of the Cytoanalyzer's plug-in printed circuitry is required simply to answer the question, "Is this a cell?" as the slide is scanned.

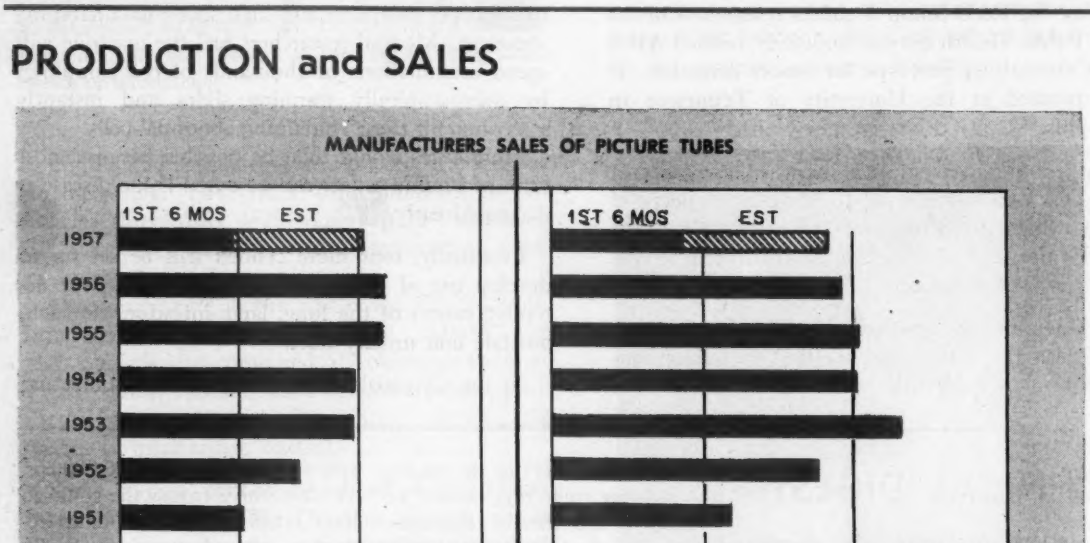
The Cytoanalyzer scans a smear and converts optical information—in terms of density and space occupied—into an electron beam. By measuring sizes and optical density, the computer and analyzer determines whether normal or suspicious cells are present.

Information about the cells is plotted on a nuclear measurement graph. Permanent record is made by a high-intensity cathode ray tube and an oscillograph camera; abnormal cell measurements are noted. Computation and scanning are simultaneous, and take less than one-fifth of a millisecond.

Eventually, if the machine gains medical acceptance, it will have to be automated for high-speed mass detection. Right now, during the Memphis trial, slides containing smears are set under the scanning microscope by hand and the cell data shown on the machine manually recorded.

For mass detection, entry of the slides into the machine must be mechanized and a punched-tape or other output device designed for the machine.

PRODUCTION and SALES



Picture Tube Sales Dip

UNIT SALES of picture tubes seem to be headed for their first dip since 1951. And dollar sales are expected to fall below the 1956 level.

Sales of 4,814,659 picture tubes in the first six months of 1957 are 7.6 percent fewer than the first six months last year. Dollar value of $87.0 million is 8.2 percent down.

Projection of first six months unit sales to the full year indicates total 1957 picture tube sales of 10.3 million. At current prices, dollar volume would be $185.3 million.

Peak unit sales of 10,987,021 tubes was reached last year. Manufacturer's value was $196.2 million. But peak value was $209.0 million, set in 1955.

Dollar sales stopped climbing faster than unit sales because of trend to lower prices. Average prices dropped from high of $23.87 in 1953 to low of $17.85 in 1956.

However, prices have increased slightly in the last six months. Average price for the half year was $18.06. Average for July was $18.09.

Number of receiving tubes sold during first six months of 1957 is also down from last year. Tubes sold through June of this year totaled 221,175,000 units, compared with 227,656,000 last year.

However, dollar value of receiving tube sales increased. Value of six months sales in 1957 was $190.5 million, compared with $184.9 million last year.

Engineers Try Brainstorming

Manpower squeeze induces electronics manufacturers to try brainstorming to increase output of ideas. Results range from "working wonders" to "rather limited." Byproducts include lists of alternates for tackling problems and making project engineers aware that they do not think of all the answers

SIXTY-TWO ideas were recorded at a recent brainstorming session on the subject of memory configuration for film storage. The session was held at the IBM research laboratory at San Jose, Calif.

Engineering shortages, rising costs, limited plant facilities and competition are all providing incentive to get more ideas out of their engineers.

Although brainstorming has had considerable attention in the advertising world, its use in engineering seems to be more limited. In a number of firms, individual supervisors have tried it. But only a few companies have formalized the technique to report results. Those who have range from enthusiastic to lukewarm.

IBM says: "Brainstorming has received lively attention in the last few years and is certainly an approach which cannot be ignored. Its use, although rather limited, has produced results—both tangible and intangible—which might not have been obtained by any other means."

R. E. Fromson of Westinghouse says: "This continuous interplay of ideas among individuals works wonders. That is, if you encourage the proper atmosphere, free of inhibitions, that welcomes each individual's natural creative abilities."

The key difference between brainstorming and other types of meetings and conferences is its uncritical nature. Advocates feel that in the usual conference ideas are often criticized, flaws are sought, the balloon is punctured before it gets off the ground.

In brainstorming, a new idea, even though it seems absurd at first, is not criticized. Instead, members do their best to build on and improve any idea germ that comes up.

In practice, project leaders at IBM's research lab use brainstorming to dig up original ideas. It suggests choosing the participants of the session with these principles in mind:

- Members should have varying backgrounds and training, yet have some contact with the subject field.
- They should have demonstrated creative ability and a tendency for original thought.
- At least one member should be outspoken and unafraid. He naturally starts the conversational ball rolling and picks it up in the event of a lull.

At the start of every session, the moderator reviews the ground rules. He then announces the subject, explains some of the problems as he sees them, and looks to the rest of the group to begin their free association of ideas.

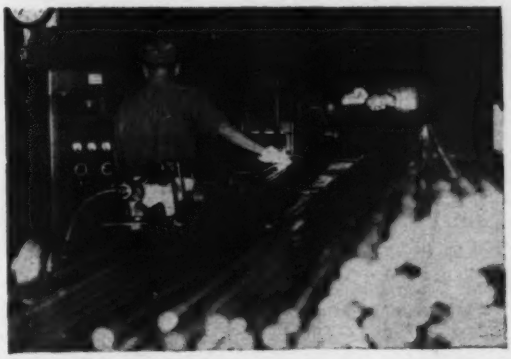
A good moderator carries the discussion over obstacles. If the stream of ideas seems to take a bad turn, he brings the panel back to the subject.

Another of the moderator's functions is to write the ideas on a blackboard as they are submitted, permitting ready reference and preventing repetition.

IBM finds that the best maximum period of time for the session is an hour. A longer period usually results in mental fatigue. (Others feel that the most fruitful part of the session is over long before this.)

The 62 ideas recorded at IBM's memory configuration session turned up nothing startingly new. The project leader felt, however, that it had provided a good check list of possibilities.

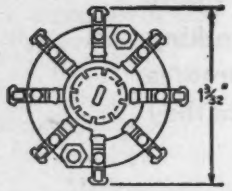
The meeting also forced a lot of good people to think about the project and, according to the project leader, this paid off later. He also mentioned feeling somewhat humbled, in that a number of pertinent ideas, some rather obvious, had not occurred to him.



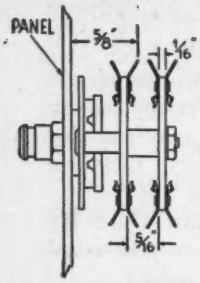
Sniffing Steel Stock

Inductive circuits in Magnetic Analysis Corp. equipment hunt flaws in steel stock at Elastic Stop Nut Corp. Device using 42 tubes and oscilloscope inspects 450-500 tons of stock monthly

NEW miniature switch...



FITS IN 1-3/32" CIRCLE



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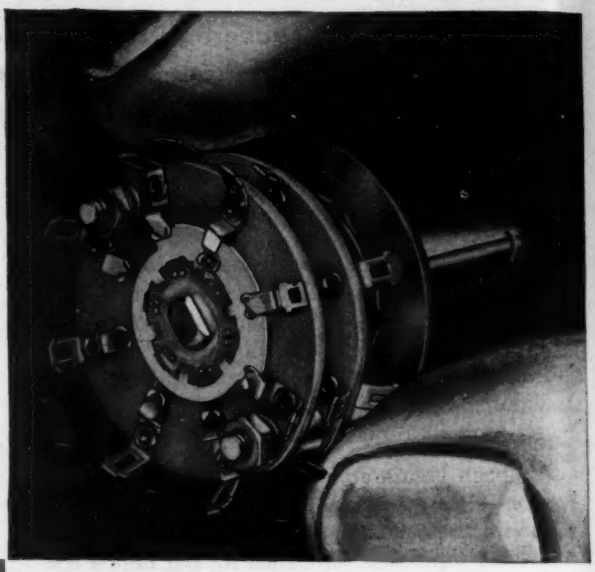
SWITCH SECTION IS ONLY 1/16" THICK

MINIMUM SPACE BETWEEN SECTIONS—5/16" WITH CLIPS ON FRONT AND BACK



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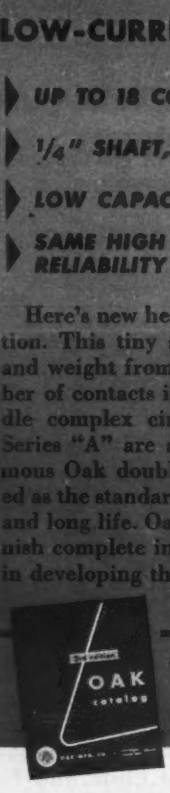

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SPECIFICATIONS

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Shafts and Bushings—1/4" shaft with 3/8-32 bushing is standard; 5/32" shaft with 3/8-32 bushing and 1/8" shaft with 1/4-32 bushing can be supplied also. Water seal bushings optional.

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Poles	8-Position (45° throw)	10-Position (36° throw)	12-Position (30° throw)
1 pole	2 to 8	2 to 10	2 to 12
2 poles	2 to 4	2 to 5	2 to 6
3 poles	2 to 3	2 to 4	2 to 5
4 poles	2	2 to 3	2 to 3
5 poles	. . .	2	2
6 poles	. . .	. . .	2

Clips—Solid spring-silver alloy or silver-plated spring brass, fastened by solid rivets.

Insulation—Stator is silicone fiber glass, meeting specification MIL-P-997 type GSG; rotor is KEL-F®, known for its excellent mechanical and electrical properties.

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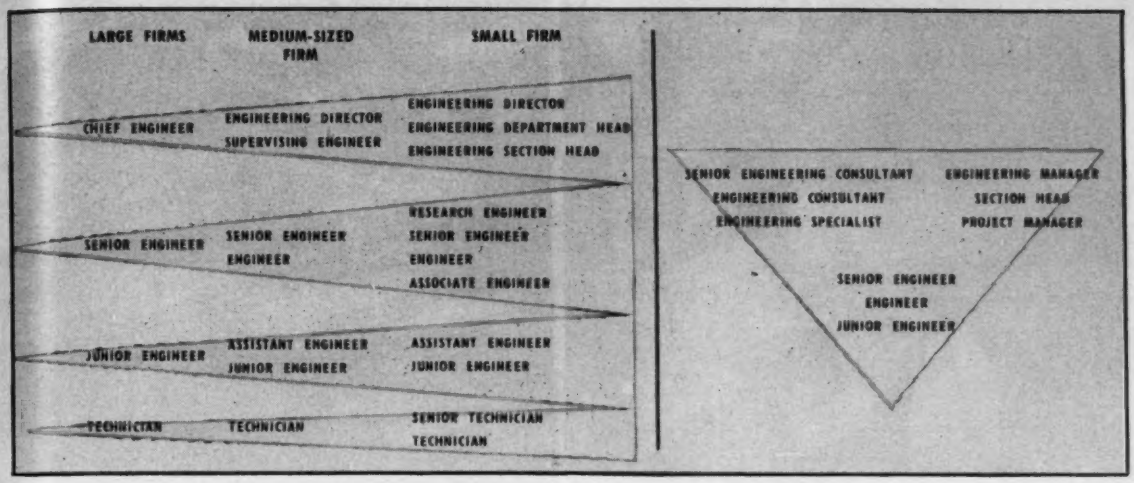


Road up varies . . some firms have two routes, but . .

Titles Mark the Way

• Electronics companies use job titles to define the chain of command and to set pay scales

• An excess of titles can sometimes cause the employee to wonder, "Does the title fit?"

ENGINEERS displaced by recent military cutbacks are finding that lack of a consistent title system in our industry complicates job hunting. But companies are beginning to talk the same language in regard to titles for technical personnel.

Three positive reasons are given by electronics firms that use titles for technical personnel: titles establish an engineering chain of command; set grades in harmony with other company operations; and give technical personnel a clearly understood ladder for advancement.

In general, large firms use many levels and they are clearly defined. In smaller firms, where technical personnel have personal contact with management, titles are often less formalized. The chart at the left gives, from top to bottom, the road up in large, medium-sized and small firms, respectively. Tinted triangles encompass similar job functions in each kind of firm.

A typical medium-sized firm with research and development as its long suit uses these titles:

• Technician: technical school education, practical experience and ability to build up breadboard circuits and read schematics. May learn his craft in armed forces or in-plant training program.

• Junior engineer: at least two years of college or technical institute training. May be actively seeking a degree part time. Has a knowledge of tubes, able to test various circuits and work with technicians.

• Project engineer: usually has degree and three to five years experience, can take charge of a phase of a project. Knows mathematics and circuit analysis.

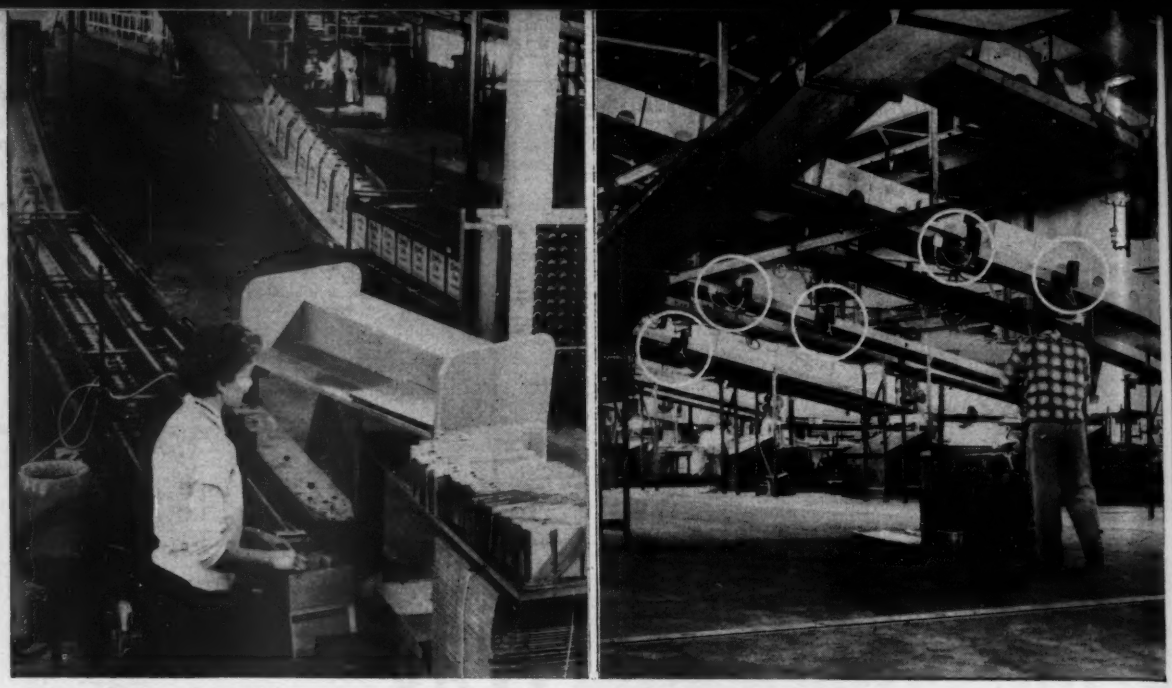
• Senior project engineer: master's or doctor's degree or equivalent experience. Supervises a project by himself or under direction of a consulting specialist.

• Assistant director and director: wide academic and practical background required, also administrative ability.

Most titling systems have several administrative and technical levels. One large firm warns against an excess of categories and allowing one title definition to slide into another. If this happens engineers may doubt they are properly graded, causing morale problems.

Another pitfall is making advancement too dependent upon either engineering or administrative ability. Either way, talents are wasted and dissatisfaction may result.

Some firms solve the problem by affording parallel paths for advancement in engineering and engineering management. (See chart, right.) Companies such as these set up super-engineering categories while still maintaining the conventional path into the management levels.



Panels (left) show demand for cartons; photocells (right) rout them along conveyors

Glassmaker Turns to Tubes

- **Newest electronic installation at Armstrong Cork bottle plant is three-mile carton conveyor system with 380 photoelectric cells**
- **In past decade, automatic electronic controls have taken over ingredient mixing, furnace control and glass-viscosity regulation**

Batching scales are photocell controlled

AN AUTOMATIC carton conveyor system, two years under construction, is now operating at an Armstrong Cork Company bottle plant in Millville, N. J.

Carton routing through a three-mile maze of 200 conveyors is bossed by 380 photoelectric cells and 12 relay control panels.

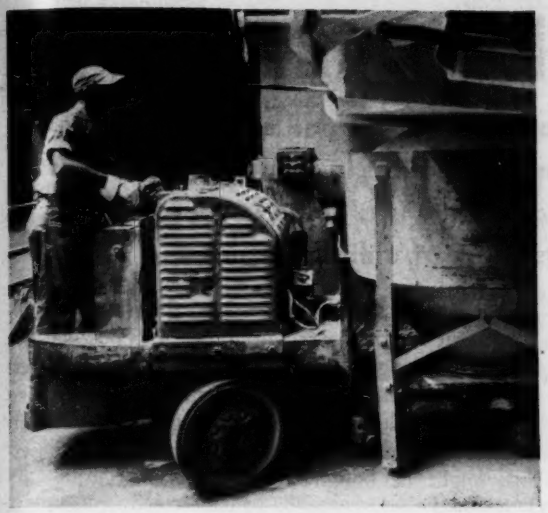
The system anticipates demands of inspection and packing stations. It will supply up to 180,000 cartons a day in as many as 27 sizes at one time.

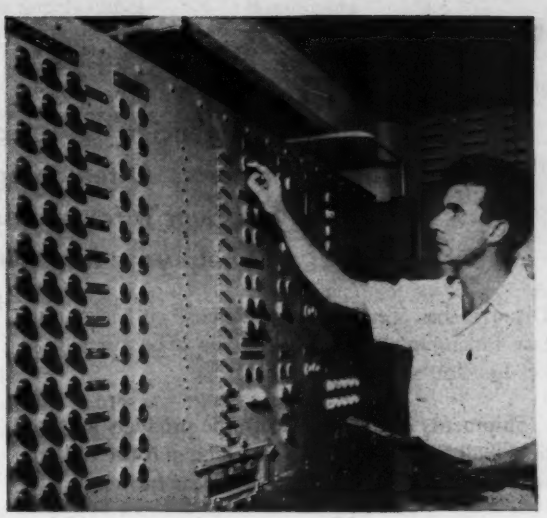
Armstrong and other glassmakers are also turning to electronics for production efficiency. The industry calculates bottle output in billions and profit in decimals.

"Modern glass production requires uniformity," explains Roger Scott, plant manager. "If there are no variables, we can adjust machines to the fine point of maximum production. Electronic controls are the best we know of for eliminating variables."

In his plant, tubes play an important part in controlling ingredient mixing, furnace temperature and level and viscosity of glass in the forming machines.

An automatic batch house uses electronic relays and photoelectrically controlled scales. An average of





Loader (left) gets signals from batch house (right) telling how much sand and chemical to add

nine ingredients are mixed and delivered at almost a ton-a-minute clip with an accuracy of 0.5 percent.

A batch staff of eight men supplies the 1,250-employee plant. Formerly, 44 men mixed 250 tons a day.

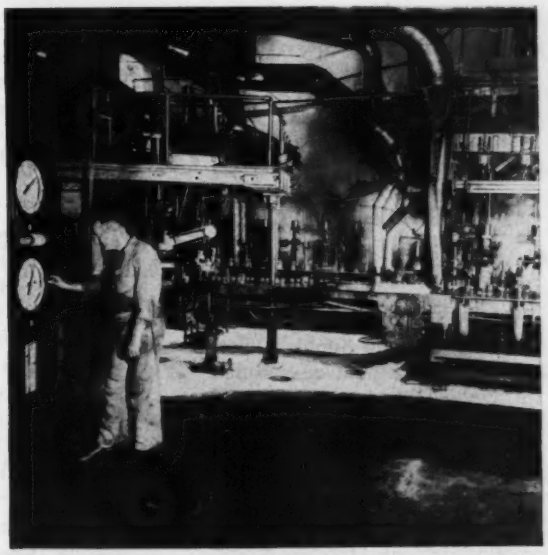
Electronic recorders guide temperature control of five huge furnaces, at four points per furnace. Probes and feedback systems automatically regulate mix feed to keep the level of the molten glass stable within 1/100 inch. Constant heat and level provide forming machines with uniform glass "gobs".

Two-thirds of the plant's glass forming machines employ dual electronic temperature regulating and recording. One part of each system cools the glass and the other conditions it with heat to get precise viscosity.

A decade ago, electronic equipment was not used. The batch house was completed in 1950. Furnace changes began in 1948 and the machines were equipped in 1951-52. The conveyor system is brand new.

Armstrong uses electronic controls elsewhere in its 18 plants making building, specialty and packaging products. A beta gage, for example, was recently installed at a Lancaster, Pa., plant to guide adhesive application to foil for bottle crown inserts.

Electron tubes monitor furnace temperature, and regulate its level during process cycle



Temperature regulators (left) help adjust the viscosity of glass entering forming machines

Where to Sell the Military

More than 20 agencies buy electronic equipment and components for the armed forces. Often an agency specializes in a single type of equipment, but buys it for all services. Here is a guide to procurement that will help your firm get its share of military business

DESPITE the recent round of defense cutbacks, military procurement continues to be a booming market for electronics producers.

Shipments of military electronic products are running well over $3.5 billion annually, and the outlook is for a fairly stable level for the near future.

Almost 85 percent of the dollar volume of military electronics buying is handled through negotiated procurement, the remainder through competitive advertised bidding. This is pretty much in line with the general pattern for all military procurement.

For many years, the high percentage of negotiated procurement has been the subject of controversy between Congress and the Defense Dept. Congressional critics have been pressuring the military services to step up competitive bidding.

But Pentagon procurement officials argue that negotiated contracting is the most effective method of buying the complex new weapons and equipment which make up the bulk of military procurement dollars. And they insist that even in negotiated procurement, competitive conditions exist since requests for proposals are sought from all qualified producers.

In electronics, as in most types of military equipment, the method of contracting depends on the amount of engineering and development involved in the procurement. Standardized components like resistors and electron tubes are bought through open advertised bidding. However, a microwave link system might be bought through negotiation.

But officials stress that as many as 120 different companies may be asked to make proposals under negotiated buying. This was the number of companies solicited for a recent Navy Bureau of Ships order for a new automatic transmitter with a frequency range of 500 mc.

To receive invitations to bid on advertised procurement or requests for proposals under negotiated buying, an electronic producer must be on the bidders list in each military electronic procurement office. This is accomplished through a detailed application listing the producer's facilities, shipments, and the like.

Below are some of the important military electronic procurement offices listed by type of equipment. Bidder's Mailing List Application forms can be obtained from each one:

AIRCRAFT AND COMPONENTS

Bureau of Aeronautics, Navy Dept., Washington, D. C.
Procurement Div., Air Materiel Command, Wright-Patterson Air Force Base, Ohio.

ALARM AND SIGNAL SYSTEMS

Aircraft Systems
Navy Aviation Supply Office, 700 Robbins Ave., Philadelphia, Pa.
Air Materiel Command.

Airport Systems
Procurement Director, Gentile Air Force Depot, Dayton, Ohio.
Procurement Director, Rome Air Force Depot, Griffiss Air Force Base, Rome, N. Y.

Miscellaneous Systems
Army District Engineer, Philadelphia District, Corps of Engineers, Box 3629, City Center Bldg., Philadelphia, Pa.
Bureau of Ships, Navy Dept., Washington, D. C.
Navy Purchasing Office, Main Navy Bldg., Washington, D. C.
Navy Aviation Supply Office
Procurement Director, Rome Air Force Depot.
Gentile Air Force Depot.

COMMUNICATION EQUIPMENT

Cryptographic Aids
Army Signal Corps Supply Agency, 225 South 18th St., Philadelphia, Pa.

Electronic Countermeasures
Gentile Air Force Depot.
Bureau of Ships.

Facsimile and Teleprinters
Army Signal Corps Supply Agency
Bureau of Ships, Navy Dept.
Procurement Div., Air Materiel Command
Procurement Director, Rome Air Force Depot

Infrared
Bureau of Ships, Navy Dept.
Bureau of Ordnance, Navy Dept., Washington, D. C.
Procurement Div., Air Materiel Command

Intercommunication Equipment
Signal Corps Supply Agency
Bureau of Aeronautics
Bureau of Ships, Navy Dept.
Rome Air Force Depot

Radar Equipment
- Army Signal Corps Supply Agency
- Bureau of Aeronautics, Navy Dept.
- Bureau of Ships, Navy Dept.
- Navy Aviation Supply Office
- Navy Electronics Supply Office, Great Lakes, Ill.
- Procurement Div., Air Materiel Command
- Procurement Director, Rome Air Force Depot

Radiac Equipment
- Bureau of Ships, Navy Dept.
- Army Signal Corps Supply Agency

Radio Communication Equipment
- Army Signal Corps Supply Agency
- Bureau of Aeronautics, Navy Dept.
- Bureau of Ships, Navy Dept.
- Navy Aviation Supply Office
- Procurement Div., Air Materiel Command
- Procurement Director, Rome Air Force Depot

Radio Navigation Equipment (Airborne)
- Procurement Div., Air Materiel Command
- Bureau of Aeronautics, Navy Dept.

Radio Navigation Equipment (Beacons, Beams, etc.)
- Bureau of Aeronautics, Navy Dept.
- Procurement Director, Rome Air Force Depot

Radio Navigation Equipment (Ground)
- Procurement Director, Rome Air Force Depot
- Bureau of Aeronautics

Radio Navigation Equipment (Oscillators)
- Procurement Director, Gentile Air Force Depot
- Bureau of Aeronautics, Navy Dept.

Radio Navigation Equipment (Ship)
- Ship Part Control Center, Mechanicsburg, Pa.

Sound Recording and Reproducing Equipment
- Army Signal Corps Supply Agency
- Bureau of Ships, Navy Dept.
- Navy Aviation Supply Office
- Navy Electronics Supply Office
- Procurement Div., Air Materiel Command

Underwater Sound Equipment
- Bureau of Aeronautics, Navy Dept.
- Bureau of Ships, Navy Dept.

ELECTRONIC COMPONENTS

Capacitors
- Army signal Corps Supply Agency
- Procurement Director, Gentile Air Force Depot
- District Engineer, Philadelphia District, Army Corps of Engineers, 121 North Broad St., Philadelphia, Pa.

Electron Tubes
- Army Signal Corps Supply Agency
- Bureau of Ordnance, Navy Dept.
- Bureau of Ships, Navy Dept.
- Quartermaster General, U.S. Marine Corps, Washington, D.C.
- Navy Aviation Supply Office
- Navy Electronics Supply Office
- Procurement Director, Gentile Air Force Depot

Headsets, Microphones, Speakers, etc.
- Army Signal Corps Supply Agency
- Bureau of Aeronautics
- Navy Aviation Supply Office
- Procurement Director, Gentile Air Force Depot

Inductors
- District Engineer, Philadelphia District, Army Corps of Engineers, 121 North Broad St., Philadelphia, Pa.
- Army Signal Corps Supply Agency
- Quartermaster General, U.S. Marine Corps
- Procurement Director, Gentile Air Force Depot

Resistors
- Army Signal Corps Supply Agency
- Procurement Director, Gentile Air Force Depot

FIRE CONTROL EQUIPMENT

Artillery Sights
- Frankford Arsenal, Bridesburg Station, Philadelphia, Pa.

Bombsights
- Bureau of Aeronautics, Navy Dept.
- Procurement Div., Air Materiel Command

Fire Control (Airborne)
- Bureau of Ordnance, Navy Dept.

Fire Control (Shipborne)
- Bureau of Ordnance
- Bureau of Ships
- Ordnance Supply Office, Mechanicsburg, Pa.

Synchros
- Bureau of Ordnance

GUIDED MISSILES

- Army Ordnance Ammunition Center, Joliet, Ill.
- Redstone Army Ordnance Arsenal, Huntsville, Ala.
- Bureau of Aeronautics
- Bureau of Ordnance
- Procurement Div., Air Materiel Command

INSTRUMENTS

Autopilots
- Bureau of Aeronautics
- Procurement Div., Air Materiel Command

Measuring and Test Instruments
- Bureau of Ships
- Navy Purchasing Offices, 11 E. 16th St., New York, N. Y., Los Angeles and Norfolk
- Navy Supply Center, Oakland, Calif.
- Procurement Div., Air Materiel Command
- Submarine Supply Office, Philadelphia, Pa.
- Navy Aviation Supply Office
- Procurement Director, Gentile Air Force Depot
- Procurement Director, Mallory Air Force Depot, Memphis, Tenn.
- Army Signal Corps Supply Agency

Navigational Instruments
- Bureau of Aeronautics
- Bureau of Ships
- Navy Purchasing Office
- Army Signal Corps Supply Agency
- Procurement Div., Air Materiel Command
- Procurement Director, Rome Air Force Depot

Simulator Components
- Naval Training Device Center, Port Washington, N. Y.

Want a Management Job?

• Having "people" skills rates high in pushing into management circles. Desire to make the move is also important

• Applications, resumes, records and tests help clue firms in finding the right man. And that's only the beginning

"MAJOR INDUSTRIES need a new type of . . . manager —a flexible man who can see beyond his own specialized area, one who can make ready decisions and who is continually learning." This statement was made recently by A. L. Malcarney, executive vice president, RCA Defense Electronic Products division, in announcing RCA's new management development program being conducted at Rutgers University.

The kind of man Malcarney describes is needed in all levels of management in electronics. Rapid expansion is creating administrative jobs almost daily for engineers. Choosing the right man for the job can make a big difference in the output of his section, his own happiness and the morale of the people working with him.

"The fact that a man is an outstanding engineer . . . does not necessarily mean that he will be successful in supervising other engineers," says the National Association of Manufacturers.

Many middle-management jobs in electronics require the technical knowledge of an engineer. In fact good engineers are likely to have some traits that are helpful in management.

"The engineer is in one sense excellent raw material for a finished leader. His technical training has conditioned him in the orderly process of thinking which, if disciplined, becomes almost an instinctive approach." This conclusion was reached in a recent study at the Graduate School of Business Administration at Harvard University.

The problem is finding among qualified engineers other personal qualities associated with success in management.

There are two qualities present in the man with management potential, says W. J. E. Crissy, psychologist and president of Personnel Development, Inc.: Look for engineers who really want to go into management and who have "people skills."

In firms that do not provide a strictly technical parallel path for advancement, an engineer who doesn't really want a supervisory job may try to get one because there is no other way to advance.

If he succeeds, he may not be happy in the long run. He may come to feel that had he stayed in engineering, he might have become a nationally recognized authority in his field. In addition, the company would have lost the services of a top engineer.

People skills are precisely that. An engineer who has them was active in college affairs, is liked and respected by coworkers, has friends with various backgrounds, takes to leadership naturally.

Management can find them in a number of ways. Crissy cautions that no one of them provides an absolute answer.

• The man's application and resume provide a wealth of information.

• Day-to-day observation by his supervisor gives many clues regarding his performance and his associations with others.

• Systematic records, such as those maintained for rate reviews, are invaluable for comparison.

• Psychological tests administered and interpreted by qualified personnel can furnish more data.

• Carefully planned interviews are among the best aids for gaining insight into the prospect's aspirations and attitudes.

• Performance in trial supervisory jobs, such as the group-leader system often found in electronics firms, give concrete information.

WHICH OF YOUR ENGINEERS HAVE MANAGEMENT POTENTIAL?

- ✓ Has demonstrated leadership ability (former positions, college and community activities)
- ✓ Fellow workers seek his advice, respect his opinion, think he's a nice guy
- ✓ Expresses himself well, especially to people with less technical training
- ✓ His friends include people with a variety of backgrounds
- ✓ His leisure time activities indicate an interest in people
- ✓ Shows even temper, emotional maturity
- ✓ Is sympathetic, emphatic, ethical

SPECIAL MARKET REPORT

AMATEUR RADIO

Poll of amateur radio operators points up increase in equipment and parts sales and shows buying trends in the $23-million 1956 market. Sales to amateurs will be up 20 percent annually from now on says one manufacturer

SINCE 1950 the number of stations squeezed into what the FCC calls the Amateur Radio Service leaped from 80,000 to more than 150,000. One estimate of the future: 200,000 before 1965.

Hams made up an annual parts and equipment market of some $20 million in 1956. Manufacturers who sell them agree on that figure almost to a man. Lowest estimate was $17 million, highest $23 million.

Future business will rise, says one, at the rate of 20 percent each year.

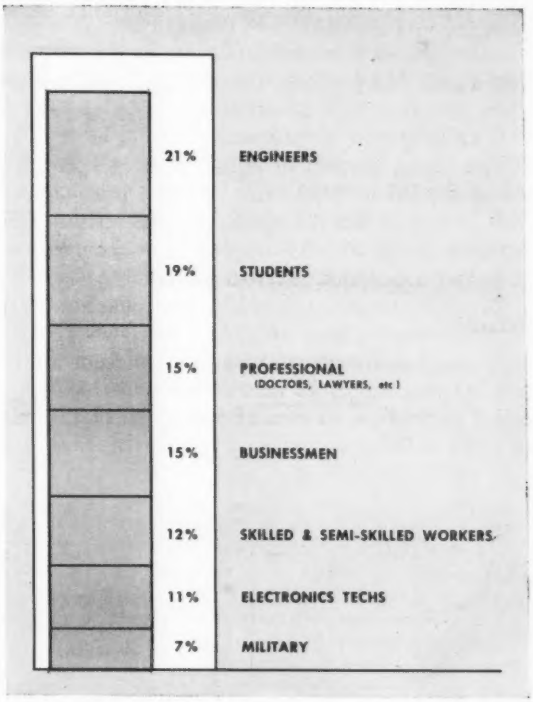
The ham in the marketplace is a mixture of builder and buyer. Since the second world war he is becoming more and more of a buyer.

One reason for this trend is availability on the market of gear the hams once had to make for themselves.

An additional reason, according to one firm, is the increasing age of hams and decreasing amount of time they devote to making their apparatus.

To determine the size and shape of the amateur radio market ELECTRONICS asked a random sample of U. S. licensed amateurs to tell us about their plans and activities.

Here are the results.



What radio amateurs do for a living

EQUIPMENT SPENDING, 1956—In 1956 35 percent of hams who bought equipment spent from $100 to $300. Completing the 100 percent figure, 21 percent spent less than $50 for equipment; 18 percent spent between $50-100; 14 percent put up more than $500. And 12 percent paid out between $300 and $500.

These percentages are for equipment buyers only; 22 percent of amateurs querried bought no assembled equipment in 1956.

EQUIPMENT SPENDING, 1957—For 1957 the pattern changes a bit in equipment spending if amateurs do what they say they will. Heaviest buying switches

downward into the range from $50 to $100.

A little more than 32 percent plan to spend between $50 and $100, a little less than 31 percent $100 to $300. Sixteen percent have spent or intend to spend less than $50. Fourteen percent are in $300-500 range and 7 percent in $500 and over category.

Challenge to salesmanship: 28 percent of the hams are unsure whether they will buy any assembled equipment at all in 1957.

PARTS SPENDING, 1956—For component parts, 28 percent of the ham buyers spent $25 to $50. Thirty percent spent less than that. Fifteen percent bought between $50 and $100 worth of parts and another 15 percent $150 and over.

PARTS SPENDING, 1957—Parts spending by amateur radio operators during 1957 will follow 1956's pattern with minor variation.

Spelling it out, 29 percent fall into $25-50 range, 24 percent in the $0-25, 20 percent in the $150 and over, 14 percent in the $100-150, 13 percent in $50-100.

Salesmanship is indicated to move parts as well as equipment. Thirty percent of the hams surveyed have yet to buy any parts in 1957 and don't know if they will.

TRANSMITTERS—Forty-nine percent of ham operators now buy their transmitters.

Price ranges are as follows.

The largest number of transmitters (43 percent) are in the $65 to $250 range. Lowest price—under $65—comes in second at 26 percent. Third (25 percent) is the $250-750 spread. Low count is in $750 and over transmitters—6 percent.

Of these transmitters, 31 percent have a final amplifier input power of 75-150 watts, 28 percent have input power of 35-75 watts, 20 percent are in 150-500 watt range, 12 percent are under 35 watts and 9 percent are in area of 500 up to FCC limit of 1,000 watts.

The popular price areas for transmitters now owned and those wanted was the same. Forty-eight percent said they might in future be willing to pay between $65 and $250 for a transmitter. Only 6 percent said they were shopping for a commercial transmitter costing less than $65.

A little more than 37 percent were willing to pay from $250 to $750. Less than 9 percent thought they could afford transmitters costing more than $750.

What hams want in terms of input power for these prices runs like this: 2 percent want under 35 watts, 9 percent want between 35-75 watts, 40 percent want between 75-100 watts, 36 percent from 150-500 watts and 13 percent want between 500-1,000 watts.

Transmitter features many hams mentioned as requirements are built-in variable-frequency oscillator, pi-network output, television-interference suppression, bandswitching and single-sideband operation.

RECEIVERS—Large majority of receivers are less than five years old. Seventy-five percent were bought since 1952.

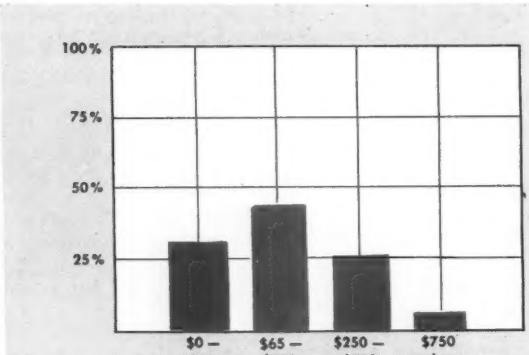
Over 41 percent of the receivers were priced somewhere in the $100-250 category, 30 percent under $100.

Sliding down the percentage staircase and climbing in price, 19 percent of operating receivers are worth from $250 to $400. Priced at more than $400 are 10 percent of receivers.

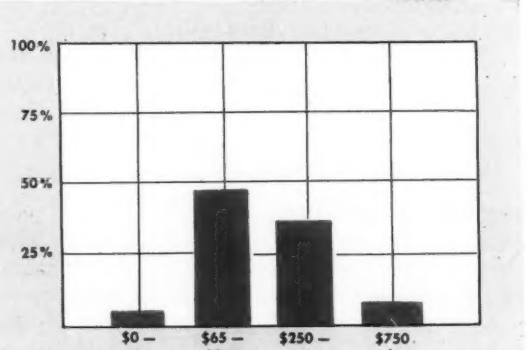
We asked: "How much would you be willing to pay for a new receiver?"

One quarter of the hams indicate they are satisfied with the radio receivers that they have, will continue to be satisfied or will undertake to build their own.

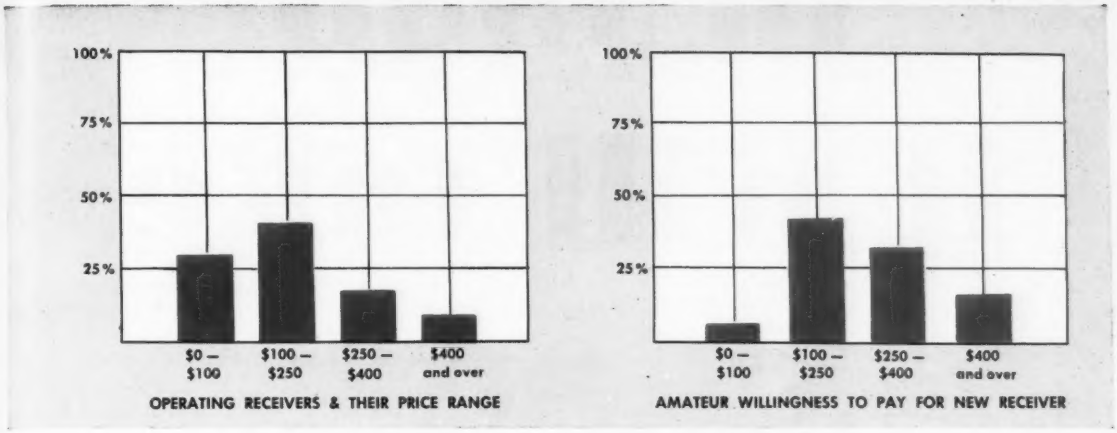
Of those remaining, 7 percent would apparently be willing to pay up to $100. Forty-three percent would buy in price range of $100 to $250. Thirty-three percent think they can afford sets from $250



OPERATING TRANSMITTERS & THEIR PRICE RANGE



AMATEUR WILLINGNESS TO PAY FOR NEW TRANSMITTER



to $400. Seventeen percent might shell out more than $400.

When asked what they want in these receivers, hams mention sensitivity, frequency stability and high selectivity. Single-sideband reception is the fourth thing on their minds.

OTHER EQUIPMENT—Other commercial equipment owned by hams runs the gamut from multimeters to a-f signal generators. Of the top ten items in popularity there are a few hams who have them all. The ham who doesn't have at least one is a rare bird.

Equipment and percentage of ownership runs this way: multimeter (72), variable-frequency oscillator (58), vacuum-tube voltmeter (51), oscilloscope (41), beam antenna (39), r-f signal generator (37), tube checker (36), frequency meter (34), antenna tower (28), a-f signal generator (23).

WHERE BUYING—Usually hams buy parts and equipment in more than one place, therefore the percentages shown below add up to more than 100 percent.

Seventy-eight percent of them buy radio parts in retail outlets. Forty-four percent buy them by mail and also from retail outlets.

Fifty-nine percent buy equipment in retail outlets, 48 percent by mail and 21 percent direct from the manufacturer.

HAM ANALYSIS—The largest group of hams today —21 percent—are, believe it or not, engineers. Nineteen percent are students. Professional men (doctors, lawyers, dentists, etc.) make up 15 percent. Another 15 percent are businessmen. Skilled and semiskilled workers are 12 percent. Electronic technicians are 11 percent. And military men make up 7 percent.

In age, they break down in this manner: 27 percent are in the 25-35 age group; 26 percent are in the 35-45 group; 18 percent are between 17-25. Thirteen percent are under 17; 15 percent are between 45-60. Just 1 percent are over 60.

Credit for technical training is given to home study by 66 percent. But most give credit to more than one source of training.

Hams dish out educational credit to the military (34 percent), college (26 percent), technical institutes (18 percent), graduate schools (15 percent), and vocational schools (15 percent).

MANPOWER POOL—Excluding novices, 8 percent of amateur radio operators have held their licenses less than a year, 22 percent from 1 to 3 years, 37 percent from 3 to 10 years and 33 percent more than 10 years.

Fifty-nine percent are either presently making their living in electronics or would like to do so. Seventy-one percent experiment with electronic circuits other than amateur radio equipment.

Seventy-eight percent use a-m phone, 62 percent c-w, 9 percent single sideband, 8 percent narrow-band f-m, 3 percent teletype and 1 percent television. Thirty percent work mobile.

Most popular ham band is apparently 40 meters, 67 percent use it. Next comes 80 meters with 60 percent. Fifty-four percent work the 10, 48 percent the 20, 33 percent the 6, 33 percent the 2.

EQUIPMENT BUYING 1956-57

EQUIPMENT PRICE RANGE	% BUYING HAMS (1956)	% HAMS (1957)
$0 – 50	21%	16%
$50 – 100	18%	32%
$100 – 300	35%	31%
$300 – 500	12%	14%
$500 & over	14%	7%

PARTS BUYING 1956-57

PARTS PRICE RANGE	% BUYING HAMS (1956)	% HAMS (1957)
$0 – 25	30%	24%
$25 – 50	28%	29%
$50 – 100	15%	13%
$100 – 150	12%	14%
$150 & over	15%	20%

in 1958 it will take 52,000 circulation to adequately cover the electronic market!

electronics

A McGRAW-HILL PUBLICATION

330 WEST 42nd STREET NEW YORK 36, NEW YORK

How to Build a Sales Force

- **Increased earnings are only one gimmick used by electronics firms to recruit sales engineers**
- **Compensation plans, other rewards keep sales up in a competitive market**

FIELD SALESMEN in manufacturing companies earned 4.3 percent more last year, on the average, than they earned the year before, according to just-released reports of the American Management Association. Management of some electronics firms expect that upward trends in salesmen's earnings will be one factor in attracting more sales engineers.

A number of other angles are being used to find men who can sell complicated electronic gear. And when they are found, electronics manufacturers will have to do a lot of thinking about compensating, managing and motivating them.

Electronics firms seem to rely heavily on more conventional methods of recruiting sales engineers. These include college and university combing, ads in industry magazines and newspapers, sounding out consulting firms and associated businesses and asking employees to keep their eyes open.

Each firm, however, seems to have its own variation for nailing down prospects.

A Minneapolis-Honeywell executive says: "We get men by stressing we're a growth company, that men have a chance to advance." The Bristol Co. favors putting job locations in ads "to attract those who want to relocate, eliminate those who don't."

Baird-Atomic has had success with hiring service personnel interested in advancing sales. Dual results of the program are: sales jobs, being a promotion, provide incentive and salesmen are familiar with products.

A Clevite official says: "Stressing education, hobby, family tree and so forth, only clouds the issue. Meet the man. If he sells you, he'll sell for you."

Flexible training programs—tailored to the product, market and man—are gaining in popularity. For example, Raytheon believes in adjusting its classes and refresher courses to salesmen's experience, type of product, current conditions.

As for which comes first, field training or plant schooling, there is no general agreement.

The Foxboro Co. prefers to put the man on the job first. It feels training the first day is apt to overwhelm a new man. Also, after being in the field a month, a newcomer asks better questions in school.

Advocates of classes say a man should know his company, products and policies first. Then, they say, selling is easier, embarrassments fewer.

Home office training varies from four weeks (many firms) to three years (occasionally at General Radio). Refresher courses are common. One firm has classes six times yearly, one or two days each time. Another company returns its men every third year for a week and home-office bosses frequently visit salesmen.

A company's product usually decides whether it wants a salesman-engineer or engineer-salesman. One sales manager cautions against hiring a capable engineer-weak seller. "He becomes like the commercial artist who gets the itch to etch and forgets his yearn to earn."

The usual methods of managing salesmen—daily call reports, memos, home office and in-the-field chats—predominate.

Alden Products reports it is systemizing more and more its selling techniques. Raytheon says it has success with this method: each salesman, a week ahead, submits his work plan for the coming week.

Another firm says, "With us, every man is his own boss. This is very important—the key to our whole selling program."

Because selling electronic products is so involved, firms try to keep paperwork down. Baird-Atomic's daily call forms are filled in yes or no.

No perfect compensation scheme for paying salesmen exists. Adjusting is a management must.

A surprisingly high percentage of firms pay on a straight salary basis. Some reasons: many persons involved in one sale; rich vs. poor sales areas; high-value product not sold often; build selling team with high morale, rather than a star salesman.

Of course, commissions, bonus deals, merit raises, incentive programs, etc.—all are part of the reward picture. General Radio says a strength of its salary-adjusted-to-sales plan is that if sales drop, salesmen lose. Barry Controls bases sales payments on group effort, thus generating team spirit.

As for quota systems, one company thinks, "They aren't needed to tell us who our good sales people are. We know. We use quotas to establish incentives, make our men better salesmen."

Multiplex Ups Profits

Techniques are coming out of development that promise growing future. One company is in negotiating stage, looks for backing

THIS YEAR multiplexing may help some f-m stations turn losses into profits. Multiplexing enables a station to emit at least one signal in addition to its publicly broadcasted one. One type of multiplexing is used by some f-m stations that supply background music to bars and restaurants. A subcarrier tone shuts off special receivers during commercials.

Coming out of the wood are some other potential methods built on the multiplexing idea.

On Long Island, Murray Crosby, president of Crosby Laboratories, has spent to date more than $25,000 on multiplex f-m technique for binaural sound.

Crosby has started the ball rolling forming an independent company. He is looking for an additional $75,000 he feels he needs before producing necessary equipment. He is negotiating with an f-m station to put system on the air.

Crosby offers f-m stations an assortment of incentives, including receiver royalty plan. Amount of stereo broadcasting done will determine size of royalty given for each set sold in reception area.

Another development using f-m subcarrier is nearing readiness, says Don Lewis, Multiplex Services general manager. A facsimile system, it reputedly works without paper but turns out a permanent copy. Lewis sees it as a delivery method for newspapers.

"A subscriber can take it into the living room and read it. Perhaps its only drawback is that you can't use it to dispose of garbage." Lewis claims to be able to demonstrate technique to clients.

Also exploring f-m multiplexing's future is Gardiner Greene, president of Browning Labs, Winchester, Mass. He sees "in the not too distant future" facsimile reproducing equipment used with f-m multiplex receivers at reasonable prices.

"There exists," says Greene, "equipment out of the development stage which could provide for the reception of what I refer to as still-picture television. A multiplex f-m station could transmit 'slides' to various types of subscribers on a closed-circuit basis."

Greene suggests applications for facsimile without permanent record, for bulletin boards in airports, railroad terminals, hotel lobbies.

"I'm no wide-eyed visionary," says Greene. "It's still up to the FCC for much of this."

Does Your Board Tell A Story?

TODAY electronics ranks number one among the "glamor" fields. Employees want to talk about what their firm is doing. They can become your best public-relations representatives.

Here's how Barry Controls uses its plant bulletin boards to spread the good word.

The firm's main board has two sections, "Making Headlines" and "Ad-Of-The-Month." In the first, are placed stories showing various things, such as uses of company products. Often these stories are produced by outside sources.

"Our 'ad' section lets our people know what we're telling the industry through the trade press," says Morris Silverman, advertising manager. He thought up this unusual bulletin board use.

Silverman's basic belief: "Only put up information that tells a story."

Barry's board is covered with glass. Crayon marks on it emphasize key facts. Regularly the board's contents are changed. Deliberate layout simplicity attracts attention —and telling a story holds it.

See Changes in Phone Service

NATION'S telephone service will undergo many drastic changes during the next decade, according to AT&T executive v-p Cliffton W. Phalen.

Request for trans-Atlantic service has grown so fast, Phalen told Chicago's Board of Trade, that AT&T will have to lay a second cable "as fast as it can." He predicted that future cables will use transistors instead of tubes, eventually will carry tv programs as well as telephone messages.

Other developments coming: nationwide direct dialing by 1965; push-button selectors replacing dials; lightweight instruments for bedside use, with an electronic signal replacing the bell; radio relays capable of handling 10,000 conversations simultaneously.

Switchgear with miniaturized memory facilities is also in the works, he said. One system under development will store 250,000 bits of information, supervise "a lot of switching circuits." Also coming, but a long way off, is a waveguide transmisison system that will handle 400,000 conversations or several hundred tv programs at a time.

Magnetic Cards Speed Handling

BIG savings in computing time may be in store for electronic computers when a Magnavox-designed Air Force system takes over routine data handling. The system was described at last month's Wescon show.

Electronic data processors spend 50 to 90 percent of their time doing routine operations such as sorting, merging, file search, data input and data output.

Heart of the new system is magnetic cards 1 by 3 inches with a storage capacity of 5,000 bits. Magnetic oxide and binder is sandwitched between a Mylar base and a thin protective overlay. The cards have the physical characteristics needed for mechanical handling and the magnetic properties for reliable reading and writing.

Information is recorded on 18 parallel channels using reading and recording techniques similar to those used with magnetic drums. Pneumatic techniques are used for selective transporting of the cards.

The manufacturer sees a number of basic advantages to the system:

- High-speed electronic processing, with an information rate up to 450,000 bits per second.
- High-capacity storage, in which over a billion bits can be stored in a space of 2.5 cu ft.
- Flexibility, that allows for use of machines in building-block style as and where needed.

College Expands In Electronics

This fall, Massachusetts college is going all-out to supply sorely-needed manpower to electronics.

Lowell Technological Institute in Lowell is giving a four-year course in electronics engineering. Half of this year's 400-member class is majoring in electronics.

The Institute has about $7-million worth of equipment on its campus. A new $2-million electronics and plastics laboratory is being built.

The laboratory is the core of Tech's expansion plans. In time, the college expects to be instructing a total of 400 electronics engineers. Present facilities limit this group.

The Institute has an overall registration of about 3,600. The breakdown: days, 900; nights, 2,500; summer, 200.

A four-year night course leading to an assistant degree in electronics engineering was started within the past year. More than 500 enrolled. Classes meet twice weekly. The course, when completed, equals two years of college.

KEY SOURCE FOR SMALL MOTORS

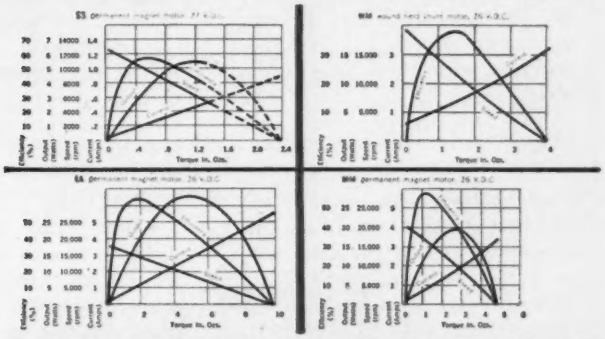
Globe Industries should be your prime source for small, peak performance A.C. and D.C. motors for fundamental reasons. For instance, the four D.C. motors shown are just a beginning —not only can you have them in countless variations, but you can add scores of standard spur or planetary gear ratios. Also, a wide variety of governors, clutches, brakes and filters are available promptly to meet any need you have. All these variables are combined by Globe to give you a motor which outperforms any other motor of comparable size.

An interchangeable standard part inventory, coupled with precision production techniques to match engineering efficiency are specific reasons why you can obtain quality custom built prototypes in 2 to 4 weeks. These same methods shorten lead time on Globe actuators, timers, rate gyros, blowers, servos.

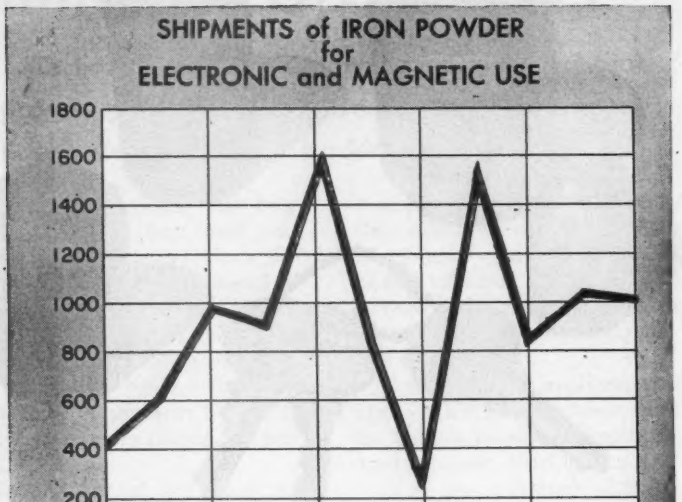
Ask the largest D.C. miniature motor manufacturer first.

Send for your copy of the Globe D.C. motor catalog now.

GLOBE INDUSTRIES, INC., 1784 Stanley Avenue, Dayton 4, Ohio, HE 3741



STANDARD CHOICES: voltages to 120 V.D.C., output to 1/20 h.p., 129 spur and planetary gear ratios, geared break away torques to 2500 oz.in., many varieties of governors, clutches, brakes, and filters are available. The graphs appearing above illustrate typical performances.



Iron Powder Plentiful

Electronics and magnetics consume more than 1,000 tons of iron powder. Powder supply remains ample and its price holds steady

METAL POWDER Association reports electronic and magnetic uses took 1,071 tons of iron powder last year. Machined parts in all industries took 14,000 tons.

It was another growth year for a commodity that has had more ups than downs recently. Progress in powder metallurgy has hiked U. S. total consumption from 2,000 tons in 1946 to 32,500 tons in 1956.

This is one electronic material with no supply problems to speak of. The Association says domestic production capacity is 48,500 tons compared with 23,000 tons of iron powder made by U. S. firms. The rest was imported, principally from Sweden.

Coarse grades are dropping in price; quality grades are fairly stable. Best grades, five to 10 microns in particle size, are presently mill-priced at 86 cents to $1.55 a pound. Prices have gone up less than 10 cents a pound since 1951.

There are a number of ways to make iron powder, by hydrogen or chemical reduction of ores, electrolytic deposition and atomizing molten metal. And there are an increasing number of ways to use it:

- Researchers are delving deeper in the magnetic properties of submicroscopic iron particles. One-domain particles—pieces so small there are no conflicting magnetic fields—are in themselves permanent magnets.
- GE, for one, is developing magnets using elongated particles weighing one-billionth of a pound. Lab-produced magnets with particles magnetically aligned and compacted in a binder equal strength of best commercial magnets, GE says. Theoretical magnetic strength is 10 times that of present magnets and resistance to demagnetization, 100,000 times.
- Better ways of finishing and surfacing sintered iron powder parts are evolving. One technique adds nitrogen as well as graphite to surfaces, resulting in harder surfaces than graphite alone. Another method fills solidified parts with other metals.

New Marketing Idea Grows

FIND OUT what the customer wants —then make it for him.

Using this concept in setting up a new marketing department is Barry Controls in Watertown, Mass. V-p Edward A. Johnson, formerly sales head, is in charge. Marketing activities of all divisions and product lines are integrated under the new department.

"The kind of marketing task in today's industrial world makes previous ideas of a sales department as obsolete as a Model"T"," says Johnson.

He believes a firm's marketing group must be represented at management levels from the top down. The group must have its say from the outset and along the way—not just when a finished product arrives.

Johnson sees a need for the integrated marketing team from "the moment a new product is a gleam in the corporation's eye." He adds: "Anything less is gambling with our business future."

Japanese Predict Big Growth Ahead

JAPANESE production rate of components and finished products will rise faster in the next three years than the present American production rate.

This opinion belongs to Toshio Takamisawa, one of 12 Japanese electronics manufacturers who recently visited U. S. plants. As Takamisawa, president of Tokyo's Takamisawa Electric & Engineering Co., says, "Japanese electronics has just come out of its embryonic stage."

"In about three years we will come to the point where we will be producing sufficiently to export units without affecting internal sales."

In 1956, electronics sales in Japan were about $1.15 billion, excluding exports, say the visitors, members of a communications equipment study team.

Semiconductors, diodes and other components are said to comprise

the biggest segment of Japan's electronics industry, with television sets second. The visitors report 600,000 tv sets now in Japanese homes, expect 1 million by the end of the year. Ten stations are operating; outlook is "at least 110 in the future."

Japanese electronics exports to Southeast Asia were said to have "little prospect," posing no threat to U. S. exports of finished products and components.

Shuttles Betwixt and Between

DISTANCES between plants have become part of the game in electronics. Getting big, a company can't normally stretch out into neighboring acres these days.

Lucky to find additional space within a few miles, company finds new problem: interplant transportation.

A. D. Little, Inc., Cambridge, Mass., has a solution in its shuttle —a sort of private taxi setup.

The firm's multi-building facilities are seven miles apart. Employees number 900, about 500 at one site, 400 at the other. Travel between sites is heavy. That's where a nine-passenger station wagon comes in.

It makes a round trip every hour for eight hours. At each end a receptionist handles reservations. Two immediate production-improving results of this system: No one makes unnecessary trips. Exact travel planning is the rule.

The shuttle's operating cost is less than $100 a month. One round trip alone by cab is $3. Company vehicle cost (even including driver's pay) is only $2. $1-per-trip saving doesn't include the passenger-load factor. No cab holds nine businessmen. The firm's wagon often does.

The company vehicle travels 27,000 miles annually. It is traded in every 40,000 miles. This is most economical, officials say.

Peak loads come on the first two morning and last two afternoon trips. Mid-day traveling normally is moderate. When reservations exceed vehicle capacity, other cars are put into use.

WARNING -- Radar Trap!
One way to get a ticket that can't be fixed is to try a high-speed sneak attack past the line of "Texas Tower" radar sentinels now guarding our shores.
When an intruder approaches, his range, bearing, course and speed are instantly flashed to our Air Defense Command, along with voice and intercept command signals. This information, "multiplexed" by Lenkurt single-sideband carrier equipment, rides ashore on a microwave radio beam.
The carrier picked for this application is standard Lenkurt equipment — the same that is in daily use by America's telephone companies. Its adaptability, proved reliability and ease of maintenance have made it the logical first choice for many vital defense installations. It offers frequency economy, saves installation space, provides a maximum number of channels at a minimum unit cost.
To carry forward your own communications projects, join the growing list of commercial and government users who look to Lenkurt for leadership in telecommunications.
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MILITARY BUSINESS

Summer Spending Slump Ends

Unusually slow beginning of fiscal 1958 is expected to pick up next week

DEFENSE Dept.'s self limitation during the past three months to obligating funds only to projects Secretary Wilson is certain not to cancel has made readers of government spending lists aware, probably for the first time, of the armed forces' dedication to jams and jellies, veal and soup.

Traditional summer doldrums in defense contracting, considered normal in July, August and most of September, began this year back in normally high-peak June. Once started, the closed-purse program remained unchanged.

Reason June did not run true to form was late realization that buying in fiscal 1957 was bypassing the budget by $2 billion plus.

Measures taken were two-fold: new contracts were held to a minimum plus instructions to stretch out delivery dates, and consequently payment, on those already signed.

Restrained activity during fiscal 1958 to date, according to one military service spokesman, results from Wilson's time-out to study duplication of programs. Purchasing agencies have been afraid to buy until it was decided what projects would be carried on.

Technical programs unaffected have been ballistic missiles, training schools and service and maintenance of already-functioning programs.

Usual cycle of activity and quiet are relatively fixed. Last month of each quarter is highest with the last month of the last quarter, June, highest of all.

Whatever is left of the entire year's funds is obligated before the new fiscal year begins. 19 percent of the yearly budget is usually spent in June.

July spending drops to four percent since Congress is generally late in approving the budget. After budget approval, Bureau of the Budget has to make its apportionment in specific budget categories within the various government departments. Controllers of the DOD, USAF, Navy and Army then must apportion funds to specific agencies for their programs.

Obligations climb only to 4.8 percent in August. And in September, spending, concentrated mainly during its final week, moves up to 9 percent.

What will happen next week?

DOD says the spending cycle is expected to pick up its old schedule.

MILITARY ELECTRONICS

• **Simplified** weather-avoidance radar for USAF aircraft that normally do not carry such equipment has been developed by ARDC's Wright Air Development Center in cooperation with RCA. Three-inch indicator shows pilot weather conditions 50 miles ahead and 30 degrees to each side. Designated APS-69, total weight of system is 70 lbs.

• **ARDC** announces "first major change in altimeters in 30 years" with new ARDC-developed drum-pointer altimeter dial that eliminates need for reading three pointers. Pointers to indicate thousands and ten-thousands of feet are indicated on a drum visible through a vertical slot in the dial. Sole pointer on new dial indicates hundreds. The instrument includes a new barometric pressure scale with a four-digit counter for faster and more accurate reading and setting. Device will be used in one of the current "century-series" fighters.

• **Electronic countermeasures** system for Convair's B-58 Hustler is being developed and produced by Sylvania.

• **USAF's** antiaircraft missile Bomarc goes into quantity production as Boeing gets $139.3-million contract with AMC.

• Gen. Schriever told Wescon: "Best advice for those interested in . . . the military electronics field is sound planning and diversification . . . exploiting present techniques, exploring advanced and new fundamental approaches. . . . Sound judgment and good management are more essential than ever before. The low cost producer of quality goods will get plenty of business."

CONTRACTS AWARDED

Sylvania has two contracts with Army Signal Supply Agency totaling $1,038,521 for design and fabrication of engineering test model of electronic countermeasures system and manufacture of crystal video receivers and oscillator units.

Fairchild Graphic Equipment gets $246,000 design and development contract with Rome Air Development Center for an electronic printing rectifier that will accept an oblique aerial photograph and reproduce a rectified image.

Vitro Labs will provide Rome Air Force Depot with automatic data-recording unit under $218,393 contract.

RCA Service Co. gets $686,574 contract with Philadelphia Ordnance District for 900 man-months of installation, repairing, modifying

and developing electronic and related equipment pertaining to guided missile program.

Republic gets $1,700,193 contract with Army Signal Supply Agency for surveillance drones and related equipment.

Texas Instruments wins $1,394,318 contract with AMC for radar sets, AN/APQ-55.

Rheem Mfg. is contracted by Army Signal Supply Agency for surveillance drones and related equipment amounting to $1,611,376.

Electronics Corp. of America has $487,657 contract with Army Signal Supply Agency for infrared detecting set.

Ryan will sell automatic navigators to BuAer under $348,016 contract.

Chatham will supply Dayton AF Depot with high-voltage rectifiers under $596,580 contract.

Machlett Labs win a $480,000 contract with Dayton AF Depot for transmitting triodes.

Siegler gets production orders totaling $1½ million from Martin for a miniaturized magnetic autopilot amplifier to be used on the newest version of the Martin Matador. Reduced in size one-tenth, the Siegler amplifier is adaptable to other missiles. Complete 3-channel amplifier package weighs 20 pounds and measures 12 by 7 by 8 inches.

Levinthal Electronic Products is subcontracted by Convair-Astronautics to design and fabricate a high-power electronic amplifier for use in a system in use at Patrick AFB that charts the trajectories of long-range missiles.

Bruno-New York Industries supplies AMC with components of instrument landing system, AN/ARN-31, under $504,406 contract.

Hazeltine sells 12 radar sets, AN/TPS-25, to Army Signal Supply Agency for $400,000.

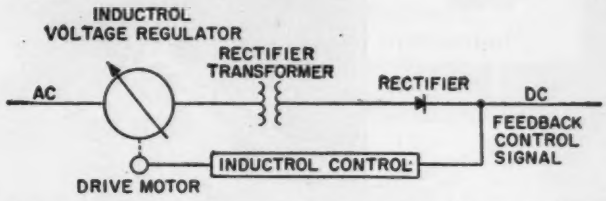
GENERAL ELECTRIC

VOLTAGE REGULATION IDEA FILE

by C. A. Neumann

ENGINEERING DESIGN IDEA: A.C. Controls D.C.

General Electric Inductrol* a-c induction voltage regulators can control d-c voltage or current. Here's how:



Inductrol regulators compensate for a-c line variations, rectifier aging effects, regulation as d-c load current varies, hold voltage (or current) to ±1%.

DESIGN BENEFITS: Inductrol regulator drift-free controls always keep voltage settings at desired level. Cost is low.

RADAR APPLICATION IDEA:

New England radar manufacturer uses three single-phase Inductrol voltage regulators to give precise individual phase regulation, hold voltage to ±1%. In addition a three-phase, motor-operated, manually-controlled Inductrol regulator is used for tube warm-up. Power can be increased by raising voltage from 0 to 600 in either two seconds or 30 seconds.

DESIGN BENEFITS: Easy-to-install, Inductrol voltage regulators introduce no waveform distortion into electronic systems.

COMPUTER APPLICATION IDEA:

Massachusetts computer manufacturer got line stability and proper tube warm-up by using both voltage stabilizer and voltage regulator. One Inductrol voltage regulator now does both jobs.

DESIGN BENEFITS: Inductrol voltage regulators have an excellent space factor, require little maintenance. They neither affect, nor are affected by, system power factor.

HEAT TEST IDEA:

Boston electronics firm uses battery of infrared quartz lamps to simulate missile in-flight heat conditions. Lamps, energized suddenly on this 208-volt circuit produced rapid heat, but lack of warm-up time caused expensive lamp mortality. A complicated and expensive wiring-switching arrangement was considered, discarded in favor of 3-phase automatic Inductrol voltage regulator.

DESIGN BENEFITS: Inductrol voltage regulators have no brushes to maintain or replace; are rugged, designed for long life; are extremely accurate and reliable.

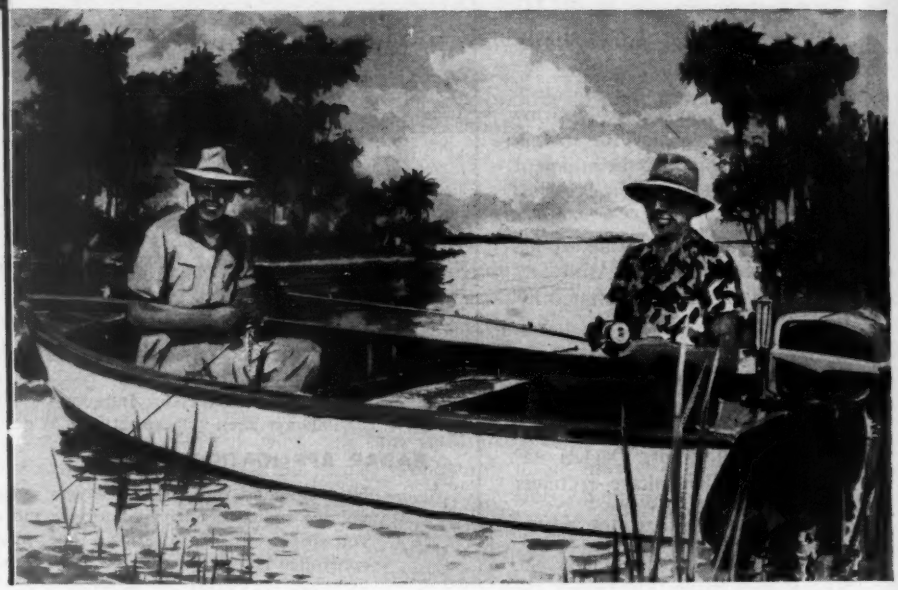
FOR MORE INFORMATION write Section 425-8, General Electric Company, Schenectady 5, N. Y.

*Trade mark of General Electric Company for Induction Voltage Regulators.

Progress Is Our Most Important Product

GENERAL ELECTRIC

Tampa's "vacation climate" attracts–and holds–engineers and skilled manpower



There must be good reasons for the trend of industry *of all types* to Tampa!

Manufacturers of electronic equipment will find important advantages here — including quick, easy, economical recruitment of skilled personnel.

Tampa's year 'round "vacation" climate and facilities draw the type of people you want — men and women seeking improved working and living conditions, who probably have been looking Florida-ward for years.

They know, in Tampa, every weekend can be filled with healthful, outdoor recreation for every member of the family. They know their leisure hours — suntanned, in sport shirts and slacks — will bring a new meaning to rest and relaxation.

And *you* know that kind of happier, healthier living means better employees, higher human efficiency, less absenteeism and less turnover.

Naturally, as the long-time industrial hub of Florida, Tampa has all of the normal, basic requirements for industrial operation.

Get the facts on Tampa! Write today to — Henry L. Toland, Chairman, Committee of 100, Greater Tampa Chamber of Commerce. Your inquiry will receive immediate — *and confidential* — attention.

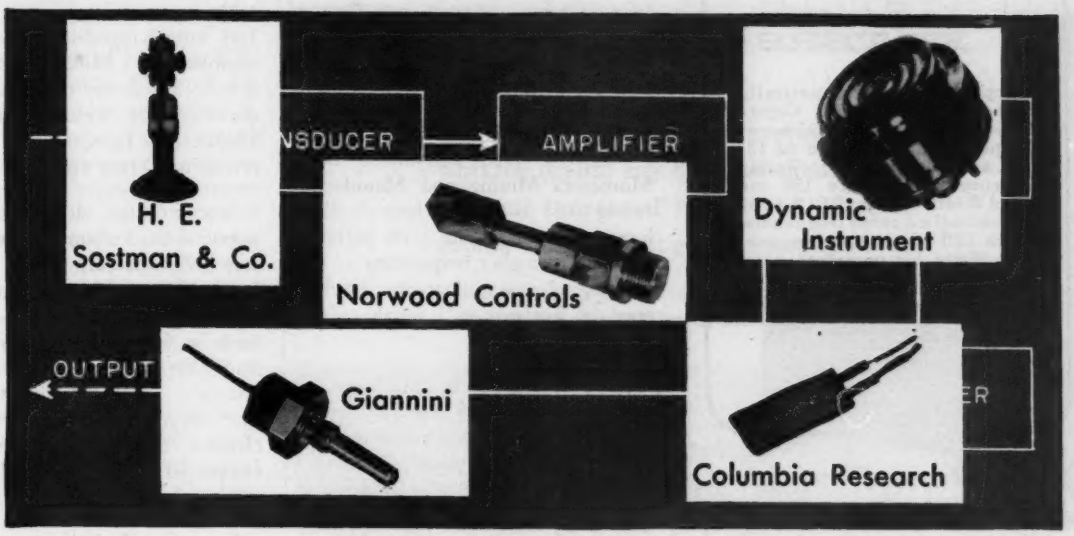
Free on request! New edition of "Tampa Facts" — a 36-page booklet with up-to-date information on every phase of Tampa's economic life.

In Tampa, you can fill every weekend with vacation fun!

Tampa

HILLSBOROUGH COUNTY, FLORIDA

Transducers Head List



Feed into Control Systems

ELECTRONIC amplifiers, control and recording systems are often used with transducers that convert temperature, pressure, position into electrical signals. Pressure transducers announced by **Dynamic Instrument** (41) are available in pressure ranges from 0-3 psi to 0-300 psi with full-scale outputs from 25 to 100 millivolts. Immersion resistant temperature probes have been designed by **Giannini** (42) for the range from —350 to 800 F.

Water-cooled pressure transducers by **Norwood Controls** (43) have been designed for use in rocket and jet engines and high-pressure, high-temperature commercial applications. Strain gages in standard, rosette and cross types are offered by **Columbia Research Labs** (44) for operation at 1,100 F. **H. E. Sostman & Co.** (45) announces potentiometer valve transducers to convert valve-stem position into an indication, record or control signal.

Miniature inertia switches announced by **Safe Lighting** (46) can be set between the limits of 1.5 and 4 g and have a tolerance of ±0.15 g. . . . A portable electronic heart monitor providing visual and audible signals for each pulse beat has been developed by **Allen Electric & Equipment** (47) for use in operating, delivery, recovery and emergency hospital rooms.

Five testing and adjustment measurements can be made on high-speed polar relays with **Sigma Instruments** (48) relay test set. . . . **Shure Brothers** (49) offers microphones with built in transistor amplifiers for use in mobile communications systems. . . . Servo magnetic amplifier designed by **Magnetic Amplifiers** (50) achieve high gain and fast response by operating at supply frequencies of 3,600 to 5,000 cps.

Mycalex (51) announces Supramica 560, a ceramoplastic said to be moldable, dimensionally stable, radiation resistant and capable of withstanding continuous operating temperatures in excess of 500 C. . . . Double-head time-relays by **Elastic Stop Nut** (52) provide adjustable on and off periods from 0.1 second to 15 minutes.

American Electronic Laboratories (53) announces crystal detector mounts for 4,000 to 8,500 mc and 8,000 to 12,000 mc. . . . A series of 24 models of power supplies offered by **Lambda Electronics** (54) features compact design and hermetically sealed transformers, chokes, capacitors.

A radio transceiver is being marketed by **Air Associates** (55) for less than $100 and is intended for aircraft, commercial and personal use. . . . **Pacific Semiconductors** (56) announces 58 silicon diodes, silicon miniature and subminiature rectifiers. . . . Independent zero adjustments for a-c, d-c and resistance measurements are said to ensure accurate meter readings on a laboratory type vtvm offered by **Acton Labs** (57).

Transistorized regulated d-c power supplies with outputs from 3 to 350 volts at 50 ma to 20 amps

For more information use READER SERVICE CARD

JK PRODUCTS

CRYSTALS
FILTERS

Compact, rugged, hermetically-sealed and stable, JK Crystal Filters (band pass filters) have a Frequency Range: 20 kc to 17.5 mc., and are available for special filtering purposes to 150 mc. Band Width at 6 db: 0.01% to 4% of nominal on most frequencies, up to 12% for certain frequencies. Write for complete data.

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Please forward my free copy of the McGraw-Hill "Industrial Direct Mail Catalogue."

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Company_____
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are available from **Perkin Engineering** (58). . . . **Microwave Associates** (59) announces highly sensitive thermistors for power measurement in the frequency range from 10 to 12,400 mc. . . . Pushbutton disconnect switches are built into **Don-Lan Electronics'** (60) r-f coaxial connectors to make disconnecting possible without separating plug and receptacle.

Magnetic tape announced by **Minnesota Mining and Manufacturing** (61) is said to have 8 db lower print level and 2 db better response to higher frequencies. . . . Portable electrocardiographs developed by **Sanborn** (62) weigh only 18 lbs.

Newly developed ceramic capacitors by **National-El Ray** (63) are said to maintain 90 percent of room temperature capacitance at temperatures up to 150 C and down to −55 C. . . . Four-ounce elapsed-time indicators offered by **Magnetic Instrument** (64) for airborne or ground electronic equipment indicate up to 9,999.9 hours. . . . **Lear** (65) announces a glide slope receiver that has a fully transistorized internal power supply and weighs only 5 pounds.

Centralab (66) has added two sizes to their line of resistor-capacitor units that require the space of a tubular capacitor alone. . . . Microwave spectrum analyzers by **Vectron** (67) are convertible for table top or rack mounting and feature interchangeable r-f tuning assemblies. . . . Miniature yokes for ⅞-inch cathode-ray tubes have been developed by **Celco Constantine Engineering Labs** (68) for transistorized deflection circuits.

Vacuum-tube electrometers announced by **Tullamore Electronics Lab** (69) measure direct current from 10^{-3} to 10^{-11} ampere. . . . Two subminiature fixed glass capacitors by **Corning** (70) have radial leads for use in printed-circuit boards. . . . An operating temperature range of −65 to 165 C is claimed for **U. S. Electronics Development's** (71) line of hermetically sealed Teflon film capacitors.

Frequency deviation meters have been developed by **Computer-Measurements** (72) that indicate deviation of a frequency from 1 to 10,000 cps in parts per million ±1 count. . . . The same antenna can be used for transmitter and receiver in the 450 to 900-mc bands with a

Pop Cap Watchdog

Electronic crown detector by RCA inspects 410 Coke bottles a minute. Sensing unit rings bell if uncapped bottle passes. Memory stops filling machine if second uncapped bottle passes in four seconds

duplexer available from **Budelman Radio** (73). . . . A pressure standard made by **Wianko Engineering** (74) for calibrating pressure instruments and measuring pressures comprises a pressure pick-up, f-m oscillator and integral power supply.

Full-load ripple of less than 0.75 percent is claimed for **Electro Products** (75) 32-volt germanium-rectifier power supply. . . . Twenty-seven channel telemeter decommutation systems designed by **Arnoux** (76) occupy 19½ inches of panel height and fit a standard relay rack. . . . Assembly of digital systems is said to be possible with a line of printed-circuit digital elements and special mounting chassis by **Comptron Corp.** (77).

Nems-Clarke (78) announces a laboratory receiver for such applications as antenna development and r-f filter design. . . . Chopper-stabilized d-c computing amplifiers are announced by **Dynalysis** (79) for performing summations, integrations and multiplications by a constant. . . . Laboratory signal generators introduced by **BJ Electronics** (80) feature five plug-in oscillators covering the most used portions of the spectrum between 20 and 3,000 mc.

A series of silicon rectifier stacks announced by **GE** (81) operate over the temperature range of −65 to 170 C. . . . Applications in aircraft, missiles and communications equipment are seen for **Price Electric's** (82) series of miniature relays. . . . Silicon rectifiers available from **International Rectifier** (83) are direct replacement for the 6X4 vacuum-tube rectifier and mount in the same socket.

ElectroData (84) announces a 10-speed magnetic tape transport for electronic data-processing systems. . . . Up to 15 kv is obtainable from a voltage source by **Harvey-Wells Electronics** (85) for insulation and dielectric testing and experiments with cathode-ray tubes.

Smooth, automatic trigger synchronization by the vertical input signal over the passband from less than 10 cps to more than 10 mc is featured in the Model 411A oscilloscope by **Laboratory for Electron-**

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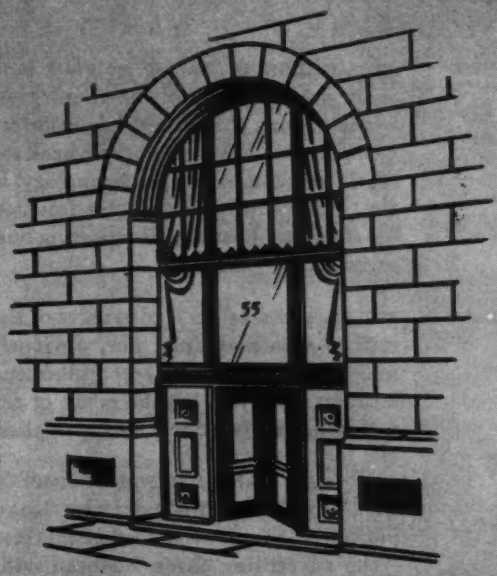

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SUCH A "MAN" IS ON YOUR PAYROLL. Be sure to "listen" regularly and carefully to the practical business information he gathers.

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ics (86). . . . **Federal Instruments** (87) announces two reflectometers that have been designed to cover the frequency ranges from 10 to 600 mc and from 300 to 2,400 mc for matching loads to transmission lines and for making measurements of reflection coefficients.

Designed for frequencies from 25 to 50 mc, a gain antenna for two-way radio communications by **Andrew** (88) features side mounting on a tower to leave space on top for the mounting of microwave or other antenna equipment. . . . A series of millimeter-wave balanced mixers has been developed by **Microwave Associates** (89) that are said to provide high local oscillator noise suppression in k_a-band radar receivers when used with matched pairs of IN53 or IN53A crystal mixers.

New Product Makers

41: Dynamic Instrument, 28 Carleton St., Cambridge 42, Mass.
42: Giannini, 918 E. Green St., Pasadena 1, Calif.
43: Norwood Controls, Norwood, Mass.
44: Columbia Research Labs, McDade Blvd. and Bullens Lane, Woodlyn, Pa.
45: H. E. Bostman, 347 E. Lincoln Ave., Cranford, N. J.
46: Safe Lighting, 527 Lexington Ave., New York 17, N. Y.
47: Allen Electric & Equipment, Kalamazoo, Mich.
48: Sigma Instruments, 47 Pearl St., So. Braintree 85, Mass.
49: Shure Brothers, 222 Hartrey Ave., Evanston, Ill.
50: Magnetic Amplifiers, 632 Tinton Ave., New York 55, N. Y.
51: Mycalex, Clifton Blvd., Clifton, N. J.
52: Elastic Stop Nut, Elizabeth, N. J.
53: American Electronic Labs, 641 Arch St., Philadelphia 6, Pa.
54: Lambda Electronics, 11-11 131 St., College Point 56, N. Y.
55: Air Associates, Teterboro, N. J.
56: Pacific Semiconductors, 10451 W. Jefferson Blvd., Culver City, Calif.
57: Acton Labs, 533 Main St., Acton, Mass.
58: Perkin Engineering, 345 Kansas St., El Segundo, Calif.
59: Microwave Associates, Burlington, Mass.
60: Don-Lan Electronics, 1101 Olympic Blvd., Santa Monica, Calif.
61: Minnesota Mining and Manufacturing, 900 Bush St., St. Paul 6, Minn.
62: Sanborn Co., Waltham, Mass.
63: National-El Ray, 11815 Vose St., North Hollywood, Calif.
64: Magnetic Instrument, 546 Commerce St., Thornwood, N. Y.
65: Lear, Inc., 3171 S. Bundy, Santa Monica, Calif.
66: Centralab, 900 E. Keefe Ave., Milwaukee 1, Wis.
67: Vectron, Waltham 54, Mass.
68: Celco Constantine Engineering Labs, 70 Island Ave., Mahwah 1, N. J.
69: Tullamore Electronics Lab, 6055 S. Ashland Ave., Chicago 36, Ill.
70: Corning Glass, Corning, N. Y.
71: U. S. Electronics Development, 1323 Airway, Glendale 1, Calif.
72: Computer-Measurements, 5528 Vineland Ave., North Hollywood, Calif.
73: Budelman Radio, 375 Fairfield Ave., Stamford, Conn.
74: Wianko Engineering, 255 N. Halstead Ave., Pasadena, Calif.
75: Electro Products Labs, 4500 N. Ravenswood Ave., Chicago 40, Ill.
76: Arnoux, 11924 W. Washington Blvd., Los Angeles 66, Calif.
77: Comptron Corp., Belmont 79, Mass.
78: Nems-Clarke, 919 Jessup-Blair Dr., Silver Spring, Md.
79: Dynalysis, 11941 Wilshire Blvd., Los Angeles 25, Calif.
80: RJ Electronics, 3300 Newport Blvd., Santa Ana, Calif.
81: GE Semiconductor Products, Electronics Park, Syracuse, N. Y.
82: Price Electric, Frederick, Md.
83: International Rectifier, 1521 E. Grand Ave., El Segundo, Calif.
84: ElectroData, 460 Sierra Madre Villa, Pasadena, Calif.
85: Harvey-Wells Electronics, Southbridge, Mass.
86: Laboratory for Electronics, 75 Pitts St., Boston 14, Mass.
87: Federal Instruments, 100 Kingsland Rd., Clifton, N. J.
88: Andrew Corp., 363 E. 75 St., Chicago 19, Ill.
89: Microwave Associates, Burlington, Mass.

Vhf Boosters Get New Look

Proposed FCC rules hit interference. They may raise booster gear cost and accomplish little.

"ILLEGAL BOOSTERS" continue to be a boiling television question. This week they are again in the limelight. Supporters of boosters are submitting technical data to the FCC in its reconsideration of the legal status of these on-signal vhf repeaters.

Although the Commission last June rejected vhf boosters completely, it changed its views a month later. Reason for the change was a petition from Governor Steve McNichols of Colorado on behalf of eleven western states. "The people living in our sparsely populated areas, located long distances from metropolitan areas, need these low-cost signals."

Estimates of the number of boosters now in operation range from a low of 300 to a high of 600. One Montana tv broadcaster estimates that six to eight of them a week are going up in his state alone.

For the FCC, the people who put them up remain elusive. Boosters suddenly pop up on mountain tops. Closed down by the FCC, they mysteriously reappear a few weeks later.

Reason for their popularity is low cost. Vhf boosters are reputed to cost $200-300, excluding labor.

FCC proposes that vhf boosters have a limit of 1-watt power input to the final radio-frequency amplifier, have minimum performance standards to prevent interference with established services, contain an automatic device to prevent malfunctioning if the booster is to be operated without a technically qualified radio operator in constant attendance.

Vhf boosters, under the FCC proposal, would get no protection from interference.

One manufacturing firm suggests that the FCC proposal is unrealistic. "If adopted as written," says Ben Adler of Adler Electronics, "no one will be able to come up with gear that'll be cheap enough. The booster today works. It interferes but it's cheap. So the operator doesn't care. My bet is that boosters will continue illegally."

FCC ACTIONS

• **Grants** KMBC-TV authority to transmit special programs of the University School of Medicine to local doctors one hour daily before start of regular broadcast day. Programs will be scrambled for broadcast and decoded on special tv receivers.

• **Permits** Western Union Telegraph to amend tariff rate for Toronto Stock Exchange ticker service furnished in the State of Florida.

• **Grants** special permission to Western Union Telegraph to establish subscriber rates for full-descriptive service on football games to be played at Memorial Stadium, Austin, Texas and at Multnomah Stadium, Portland, Ore.

• **Amends** tv table of assignments. Commission substitutes channel 15 for 41 in Florence, Ala., changes channels in Gadsden, Ala., from 15 to 37, in Corinth Miss., from 29 to 41, in Grenada, Miss., from 15 to 44.

• **Drops** proposal to restrict tv translator stations. Commission had considered limiting tv translators to areas without regular tv stations and requiring that they cease operation when tv stations enter the areas. When and if translators arrive as competition to regular tv stations, the Commission will consider each specific case.

• **Adds** television channel 8 plus to Brookings, Oreg., and channel 6 minus to Eureka, Calif.

• **Appoints** Joseph M. Sitrick to be Legislative Assistant to chairman John C. Doerfer. Prior to this announcement, Sitrick served as publicity and special projects executive on the National Association of Radio and Television Broadcasters.

• **Stopped** disruption of aircraft communication in a fifty-mile radius of a Minnesota airfield. FCC engineers discovered that an electric doorbell's temperature-control strip had pitted contacts causing rapid on-off behavior.

STATION MOVES AND PLANS

WTIG, Massillon, Ohio, changes type transmitter.

WSBT-TV, South Bend, Ind., installs auxiliary antenna system at main transmitter site.

WESO, Southbridge, Mass., increases power from 500 w to 1 kw.

KRD and KRD-FM, Los Angeles, Calif., has a shift in station control. Albert Zugsmith pays R. C. Simonton $107,500 for 36.67 percent. Zugsmith already owned a third of the station.

WLOW, Portsmouth, Va., becomes property of James Broadcasting. James pays $250,000 to Winston-Salem Broadcasting.

WCRY, Macon, Ga., moves studio and transmitter location.

KFJZ, Fort Worth, Tex., installs new auxiliary transmitter.

KHMO, Hannibal, Mo., control

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goes to Mark Twain Broadcasting from Mount Rainier Radio and Television Broadcasting for $97,500.

WARB, Covington, La., licenses go to WARB, Inc. from A. R. Blossman, Inc. WARB, Inc. (Blossman, president) pays $55,269.

KCIJ, Shreveport, La., changes hands from Southland Broadcasting to Edward E. McLemore. Price is $75,000.

WMSA, Massena, N. Y., installs new transmitter.

WSPN, Saratoga Springs, N. Y., installs new transmitter.

KWSK, Pratt, Kan., installs new transmitter.

WMEX, Boston, Mass., is sold to Maxwell E. and Robert S. Richmond by New England Radio for $215,000.

KUTI, Yakima, Wash., is sold by Independent Broadcasters to Harrison A. Roddick for $237,500.

WTOV-TV, Norfolk, Va., changes studio location to Portsmouth, Va.

WGGH, Marion, Ill., installs old main transmitter for auxiliary purposes.

WLBN, Lebanon, Ky., is sold by Lebanon-Springfield Broadcasting to Horace E. Tabb, Holly Skidmore, Stokley Bowling, C. A. Diecks, J. W. Hodges and W. Dee Huddleston for $65,000.

WPLY, Plymouth, Wis., becomes property of CMB, Inc., for $65,000.

WMMH, Marshall, N. C., is sold. Cleatus O. Brazzell, Vernon C. McCarthy and Andrew D. Shields pay Harold H. Thoms $20,000.

KPLK, Dallas, Ore., control passes to D. H. Meves for $45,000.

KERV, Kerrville, Tex., control passes for $30,000 to Clyde Jones and Albert F. Mason, Jr., from Arthur G. Rodgers.

Highways Spur Growth

New Hampshire's road program "pulls" Boston closer, attracts firms. Electronics work force leaps 900 percent in 10 years

TODAY New Hampshire is doing all possible to help electronics firms find the road to success. So it's building new highways.

The method's paying off. In 1947 New Hampshire had 14 electronics plants employing 720. Today its 35 plants provide work for 6,880, more than nine times as many.

The state's highway program was a factor in attracting Raytheon, Sylvania and Sprague plants.

As of this week, N. H. boasts 70 miles of new four-lane highways—all funneling into research-rich Boston. And work is underway on 100 more miles to be finished in under five years.

"Our highway program has extended New Hampshire's industrial frontier 30 miles northward," says a state official.

Practically all of N.H.'s electronics activity is in the state's lower third—25 to 100 miles from Boston.

Electronics is easily the fastest-growing industry in N. H. It has virtually offset textile losses.

This is all the more surprising when it's known that industrial parks have played a minor role. Why? They're just starting in N. H.

Only one such park—at Hooksett—is functioning. (Raytheon has the only building there. Another plant is being built.)

Two other industrial parks are on the drawing boards.

And for electronics firms, this is the enticing part: new plants are being designed specifically to attract electronics-type industry.

Busiest centers now are Manchester-Nashua, Keene-Claremont, Dover, Concord and Laconia.

Firms include: Manchester—Insuline Corp. (assemblies), Northeastern Engineering (test equipment), Rust Industrial (instruments); Nashua—Sanders Associates (components), Sprague Electric (capacitors).

And, Keene—Miniature Precision (bearings); Dover—Clarostat (devices); Concord — Northeast Electronics (R & D); Laconia—Beauchaine (parts).

Sprague also has a plant in Concord. Sylvania's new branch in Hillsboro produces semiconductors. Raytheon (components) is operating in Hooksett.

Manpower is no problem in New Hampshire. It is high-quality, productive, firms there report. And—key factor—there's an abundance of female help.

Major assistance to incoming industry is offered by the State Planning and Development Commission. Supporting it are the N.H. Industrial Park Authority and N.H. Business Development Corp. All three are headquartered in Concord but function independently.

In addition, more than 30 local industrial foundations are working to expand electronics' rock-like hold in the Granite State.

New Hardware Counters Stress

HARDLY a month passes without nut-and-boltmaker's offering new answers to an old problem: how to keep fastenings from loosening under environmental stress.

Some of the newer locknuts with electronic applications are:

- Types in which six bracing fins provide uniform tension on a one-piece jam-nut; available in microsizes from Tubing Seal Cap.

- Locknuts with scooped out shoulders to reduce weight, by Standard Pressed Steel.

- Miniature self-locking clinch nuts by Elastic Stop Nut that can be installed in 0.030-inch sheet stock.

- Self-threading locknuts for die-cast or forged studs, either plain or with Plastisol sealer, from Palnut.

- High tension self-locking nuts with permanent lubrication, by Kaynar.

- Preassembled nut and helical spring washer combinations, from Jacobsen Nut Manufacturing.

A number of firms offer screw parts which lock internally. Heli-Coil has a series of self-locking wire thread inserts with an integral gripping coil. They can be used in place of tapped threads without external locking devices.

One effective technique is insertion of a nylon pellet or plug into the screw thread. Forcing the nylon into the mating thread creates a bond and also makes the screw hole liquid-tight. Makers include Nylok, Republic Steel, Lamson and Sessions, Continental Screw, Buffalo Bolt and Standard Pressed Steel.

Feedback Guards Gas Compressors

NEW FEEDBACK device called Surgetrol will protect gas pipeline compressors from surge. Surge, the backing up of gas into a compressor station after a drop in pressure, will cause extensive damage to machinery if not corrected in time.

With the new system, a transducer detects pressure variations at the discharge side of the station. Pressure oscillation or surge is automatically corrected by adjustments of the compressor's electrical load or turbine speed. The device uses seven electron tubes.

The unit is designed to keep compressors on the line even in the critical range of operation. Without such a device, compressors have to shut down for safety.

Surgetrol was invented by F. Vinton Long, a project engineer with Texas Eastern Transmission Company. Three are now in use on 15,000-hp stations. Long has licensed Control Corp., Minneapolis, as manufacturer.

Price has not yet been set. A large volume market is not expected since only certain special cases require it. Other uses may be in blowers and liquid centrifugal pumps.

Foreman presses pushbutton, then watches steel ingot on tv screen, while another monitors hot-strip rolling as . . .

Tv Ups Steel Output

Ruhr steelmaker August Thyssen-Huette increases output, quality and safety with closed-circuit television to monitor operations

CLOSED-CIRCUIT television is watching steel production in West Germany today as the eyes for pushbutton control.

West Germany's steel industry, already recovered remarkably from war damage, is now introducing large-scale automatic controls. Tv cameras at key points in the production line and a similar number of receivers at a control center are an integral part of the automatic system.

More than a year ago, without fanfare, August Thyssen-Huette, a leading Ruhr steelmaker, installed a Grundig-designed tv system in its Duisburg-Hamborn plants.

Last month, as other West German steelmakers prepared to follow suit, Thyssen-Huette gave an inkling of what television and automatic controls had accomplished. In 1956 the firm reached its peak postwar high of 1.6 million tons of crude steel. This fall, months ahead of schedule, an output rate of 2.4 million tons is expected.

Installation consists of six camera-transmitters that can be swiveled to different positions, and six receivers in the main production control center, plus an additional monitor. Thyssen-Huette production supervisors trained by Grundig operate the tv as well as other controls.

The steelmaker reports television improves production line control, speeds up production on its new hot-strip rolling mill and provides greater worker safety.

An operator at a console can watch every movement of each ingot up to 100 yards away and around corners. When the mill's rollers are clear, he can send another ingot on its way immediately. He is thus able to maintain continuity of operation with little chance of error or accident.

Buttons corresponding to various operations are on the console in the control center. While he exercises pushbutton control, the operator can see on the screen before him exactly what is happening. He can do this for any of the six process points watched by tv cameras.

Later this year the firm will set up another closed-circuit tv operation in a new blooming and slabbing mill, where the camera will be 200 yards from the operator.

At one of the process control points now, Thyssen-Huette increases efficiency and improves quality in the processing of steel sheets through the hot-strip rolling mill to the haspel. No longer is the supervisor's vision hindered by a crane and pedestrian bridge. An "eye" at the scene constantly watches the steel strips as they roll.

Military Wants 99.99% Relays

RELIABILITY considerations of military electronics have brought relays to a crossroads. They will have to be made more reliable or face substitutes, according to D. H. Cunningham of RCA components division.

Speaking at Wescon, Cunningham said the military now wants 99.99 percent reliability. With 99 percent reliability, he explained, a system with 25 relays would have an "intolerable" combined reliability of only 77 percent.

Much work has already been done to improve relays. Some solutions cited by Cunningham include: getters to absorb organic vapors, design changes to avoid contact erosion, Teflon terminal shields to prevent grounding, elimination of erratic spring pressures by better design, improved circuit arrangements and better loading combinations.

Cunningham also suggests design to withstand stress, contaminant-free materials, close-tolerance mechanized assembly equipment and quality tests at each manufacturing step. He opposes miniaturization and cost cutting when they affect reliability.

In another Wescon talk, James Daniels, of Jennings Radio, described a relay designed to solve a reliability need for dry, that is, very-low-power circuits.

The stacked ceramic vacuum relay was reliable at all power levels. The manufacturing process features 850 F bakeout and power run-in, while the units are still on the vacuum pumps. Triple contacts at each stack curtail missing.

Radio Amateurs Explain Needs

SOME 5,000 eager amateur-license holders swarmed through the ARRL's 9th national convention in Chicago recently and set manufacturers to licking their chops in anticipation of solid orders to come.

There are about 160,000 licensed amateur radio operators in the U. S. About 25,000 persons get amateur licenses yearly. This has been the

rate for the past several years. With attrition due to deaths, drop outs and exam failures by novices; there is a 10,000-12,000 net gain in hams per year.

Visitors to the ARRL show expressed interests and needs as manufacturers "lent them their ears." What do they want? Phil Haller, chairman of the Chicago area Radio Club Council and convention program chairman, says:

"There is a need for a more portable type of transceiver. We would like to keep present transmitting power and receiving sensitivity, but with less weight. We're waiting for someone to develop a power supply other than the large iron-core transformer jobs."

ARRL's general manager of the convention, Jordan Kaplan says, "There's additional need for low priced gear. Our hobby is getting to be a high-priced one. In single sideband, for example, you have to start at $600 and up, and the sky is the limit."

"We need ssb vhf equipment for amateur use. There is fast growing movement of hams to the upper frequencies—50, 144, 220 mc and higher. Presently the bulk of amateur communications are in the 1.8 to 30 mc range."

The manufacturers whetted the ham's appetites at the show by either displaying or discussing ssb units. Travis Marshall and Fritz Franke of Hallicrafters pointed out their firm's amateur sales went up over 50 percent after showing their SX-101 receiver and HT-30 transmitter exciter. This year they displayed a prototype, 100-percent transistorized ssb, a-m and f-m receiver scheduled for quantity production "in a few months." Company plans call for an all-band ssb, partly transistorized, mobile or fixed transceiver before 1958.

Collins Radio's Preston Simms displayed the company's new ssb mobile transceiver and said the unit has "a number of transistors in the power supply, instead of a dynamotor or vibrators."

Knight Electronics' Tom Pickering caught the ham's attention when he pointed up printed circuits as a problem solver for amateurs building kit-type receivers, with special emphasis on lead dress and wiring headaches.

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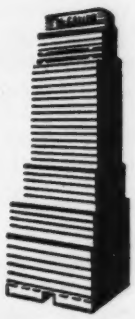

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U.S.-U.K. Tieups Set Pattern

Joint firms, license agreements benefit business to both nations as international pattern emerges

SEVERAL recent announcements of Anglo-American joint venture companies and licensing agreements are today calling attention in the U.S. electronics industry to the factors behind such tieups.

The Rheem-Solartron agreement setting up a jointly owned research and development firm, and the licensing arrangement between Robertshaw-Fulton and Wayne Kerr Laboratories, are two examples.

There are a number of advantages for American firms, particularly when the agreement provides for manufacture in Britain. Manufacturing costs go down by a ratio of 1.25:1. Commonwealth markets, with their preferential tariff for British-produced goods, are opened.

From the British viewpoint, the main considerations seem to be: the Government's pressure for dollar earnings; recognition that Britain's most profitable and traditional exports have been know-how and technique, rather than hardware; increased Anglo-American standardization, partly due to Nato requirements in radar and other electronic gear.

Previously, British firms took out a license for the manufacture of U.S. equipment on a straight fee basis. But today's capital restrictions have made money tight. Now many British firms seek exchange agreements.

Often it is the small British firms that conclude U.S. merger or license agreements. One reason: A chance for expansion of research and development into fields allied to their own. This might otherwise require too much time and expense.

Others gain needed production facilities to compete in the American market.

While Britain has much to offer technologically in electronics, the introduction of the European Common Market may alter the pattern of U.S. firms seeking overseas agreements. Manufacturing costs in many European countries are lower than in Britain.

Traders believe U.S. commercial agreements in Britain have set the pattern. They see the growth of European free trade areas and freer exchange of ideas fostering more international electronics trade agreements.

DEVELOPMENTS ABROAD

• **In England,** tandem electrostatic generators for two-stage particle acceleration will be installed at the Harwell atomic research station and at the atomic weapons research establishment at Aldermaston. Metropolitan-Vickers Electrical Co. will design and construct the accelerators in collaboration with the United Kingdom Atomic Energy Authority.

• **In Britain,** radiographic equipment that detects minute changes in a specimen's density can be used in finding forged paintings, postage stamps and documents. The equipment, developed by Newton Victor Department, Metropolitan Vickers, is used for checking spot-welded joints in thin aluminum and for examination of low density plastic moldings.

• **In Belgium,** the Postal and Telecommunications Group of the Brussels Universal and International Exhibition announces that an international conference on Solid State Phenomena in Electronics and Telecommunications will be held at the University of Brussels, June 2-7, 1958. Subjects will include semiconductors, magnetic materials and photosensitive and luminescent materials.

• **In Manchester,** England, Metropolitan Vickers announces two new special types of mass spectrometers. One is for determination of isotope ratio by surface ionization techniques. The other is for analysis of impurities using spark ionization techniques.

• **In London** Battelle Institute announces a high-temperature x-ray powder diffraction camera for studying materials up to 2,000 degrees C in a vacuum or in a controlled atmosphere. Battelle will use the instrument to study metal alloys and ceramics.

EXPORTS and IMPORTS

Lebanon has placed a $3-million order for a radio broadcasting station with the German firms Siemens and Telefunken. Only an overall agreement has been signed with details still being negotiated. However, it's understood the order comprises a studio in Beirut, a broadcasting building in a town between Beirut and Tripoli and two 100-kw transmitters for medium and short-wave transmission.

England's Automatic Telephone & Electric Co. Ltd. has licensed Florida electronic firm Radiation, Inc. to manufacture and sell teleprinter circuit test gear developed by AT&E. The equipment measures distortion in radio and land-line teleprinted circuits and automatic switching networks.

West Germany's first radar export orders since World War II have been placed with Telefunken hard on the heels of the first domestic

orders. Airport installations will go to Bombay, India, and Rio de Janeiro and Sao Paulo, Brazil. Telefunken is licensed by Bendix Aviation Corp. West German firms were permitted to reenter the radar field two years ago after a ten-year ban.

England's first computer exhibition and symposium will be held in London Nov. 28-Dec. 4, 1958, according to the Radio Industry Council. It's sponsored by joint committee of Radio Communication and Electronic Engineering Association and Office Appliance and Business Equipment Trades Association.

Italian firm Tele F'Lux is offering a license to a U. S. manufacturer to make its Fonotron device which gives an acoustic and visual warning to a truck driver of a vehicle coming up from behind. Company says the Italian Ministry of Transport has made the transistor signaling device compulsory on all heavy duty trucks. It's 8 by 7 by 3 in.

In London Decca Radar announces an order from the Texas Company for true-motion radar installations for three new vessels. Decca says some 65 ships have been fitted in ten months, with fittings being made at the rate of eight a week on 230 orders for future installations.

Argentina's national meteorological service has received the first of four windfinding radar sets ordered from Decca Radar Ltd., London. Argentina is setting up a network of upper-air windfinding stations to provide data from heights up to 100,000 ft. Information will be contribution to International Geophysical Year studies of general circulation of the atmosphere.

In Capetown, the South African Mutual Life Assurance Society has ordered Ferranti's Perseus data-processing system for 1958 delivery at a cost of nearly $700,000. Powers-Samas card reader will be used for input. Premium notices and statements will be printed by Powers-Samas tape printed with a 50-character repertory at 42,000-characters-per-minute speed.

VIRGINIA
has power aplenty for your plant

Three centuries ago, power in Virginia meant the splash of water on a millwheel. Or, perhaps, the creak of slowly turning sails, like those of historic Robertson's Mill now grinding meal once again in Colonial Williamsburg.

But today Virginia power means kilowatts. And her utilities have been farsighted in building ahead of need. The two largest have stepped up system power capabilities by over two million kilowatts since 1947 to a present total of 3,432,000 kw . . . due to reach 4,400,000 kw by 1959.

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PLANTS and PEOPLE

RCA Shifts Executives

New president John L. Burns, apparently having gotten the "feel of the saddle," is beginning a methodical shakeup of RCA organization. A lot of changes are in the air; some are already on paper. Newformed industrial electronic products organization is filling out its table of organization, and there are some shifts in other parts of the corporation.

Thompson H. Mitchell gets the job of general manager in the telecommunications division. This division brings together communications and broadcasting activities of RCA Communications Inc. and what used to be the firm's commercial electronic products division. Mitchell is president of the communications subsidiary, a post he will continue to hold.

A. R. Hopkins, who managed the commercial electronic marketing department, becomes manager of industrial electronic marketing. He takes on responsibility for planning and marketing of all the firm's line of industrial electronic products.

Industrial electronic products organization was established in June with longtime RCA man Theodore A. Smith as exec v-p over the whole shebang. Smith, who had been in charge of defense products, is shown in the picture at left, with RCA Service Co. v-p W. L. Jones and Travelers Insurance Co. vice president V. T. Dow. The occasion was one of Smith's first big triumphs in his new job: the signing of a multimillion-dollar contract with Travelers for four Bizmac systems. The insurance company installation, which will start going next spring, includes more than 270 units of Bizmac gear, will probably be the most massive installation of its kind.

Hopkins and Mitchell made some top-level changes in the industrial products organization immediately on settling into their jobs.

Hopkins hired Thomas H. Armstrong away from a vice presidency at Underwood Corp. to give him the new post of manager for Bizmac sales plans and programs. He also gave John P. Taylor the job of manager for marketing plans and services.

Mitchell passed out a new round of executive jobs in his communications subsidiary. Sidney Sparks, v-p for commercial activities, moves up to become v-p for operations and engineering. Controller Lon A. Cearley becomes v-p for finance, and treasurer Frederick J. Sager gets a vice presidency while keeping the same job. Assistant controller Edwin W. Peterson gets Cearley's old job as controller.

Meanwhile, six executives of RCA Service Co. get new assignments. Donald H. Kunsman becomes v-p and operations manager; R. N. Baggs moves up to be v-p and general sales manager; Anthony L. Conrad is new v-p for government service; Stephen D. Heller becomes v-p in charge of missile test projects; Gerald W. Pfister gets the vice presidency for consumer products service; and Edgar H. Griffiths takes on the joint jobs of treasurer and controller.

In the RCA Victor Distributing Corp., C. F. Parsons becomes vice president for sales. Until recently, Parsons was vice president and general manager of Zenith Radio Distributing Corp.'s Chicago branch.

New Plant for Collins

Collins Radio is putting up a 235,000-sq ft manufacturing plant in Cedar Rapids, Iowa. The new $2.75-million plant will house a sheet metalworking department, machine shop, engineering model shop, and painting and plating departments. It will occupy a 90-acre tract across the street from Collins' engineering lab.

Some 1,000 workers will begin moving in early in 1959. Grading and foundation work will be wrapped up this year, and construction will begin in the spring.

Collins is also building a 128,000-sq ft engineering lab in Richardson, Tex., a Dallas suburb. New lab will cost $1.7 million.

Meanwhile, the company's Washington, D. C., office gets a new chief of government relations. Howard C. Briggs moves into the slot from a vice presidency at Hoffman Labs.

Top Shifts at Microdot

In South Pasadena, Calif., Microdot Inc., maker of microminiature coaxial cables, gets two new top managers. Moves result from retirement of double-threat Gordon P. Felts, who served as both presi-

dent and chief engineer of the firm. Felts retires to a consultant's berth.

Clayton Triggs leaves a job as managing director for USO activities in the Southwest to take over as president. Triggs has served on Microdot's board for four years.

New chief engineer of the company is Jerry Parks, who left Cal-Tech's jet propulsion lab a year ago to go to work for Microdot.

Calidyne Builds New Center

In Woburn, Mass., the Calidyne Co., maker of vibration test gear, is putting up a 46,000-sq ft plant on a 12-acre site bordering New England's "Electronics Row," Massachusetts route 128.

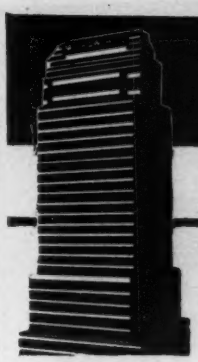
New $500,000 plant will consolidate operations now spread all over Woburn and nearby Winchester. Calidyne, which was born in a garage in Winchester nine years ago, will start moving its 400 employees into their new home early next year.

Colleges Buy Electronics

More electronic gear is going into colleges and universities. Spokesmen for the computer industry, for example, are confidently predicting that one day all colleges will have their own computers. A raft of universities are buying such heavy research tools as particle accelerators: New York University and Florida University have just ordered one each to be used in training nuclear engineers and for campus research programs.

And out in California, electronics is playing a big role in UCLA's new cardiovascular research lab. Amplifiers, signal generators and other gear will help lab director Dr. Wilfried F. H. M. Mommaerts and his staff understand how the heart beats and what causes its failure.

Experiments with the technique of the "frozen twitch" will throw light on the problem of muscle construction. Frog muscles, frozen in liquid propane at rest and in action, will permit chemical analysis of the twitching impulse. Other



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studies will probe molecular structure of contractile fibers.

Lab scientists are currently building a high-current pulse generator for stimulation. Work is also being done on a high-speed ultrasensitive galvanometer and a high-speed thermopile. A photometer for chemical analysis is in the design stage.

Farnsworth Opens Lab

FARNSWORTH Electronics will build a $3-million plant in Fort Wayne, Ind. Surprise announcement of the plans came during dedication ceremonies of the IT&T division's research and development laboratories. Speaker at the ceremonies was Senator Homer Capehart (R., Ind.), shown at right in the picture with IT&T executive v-p Fred M. Farwell, IT&T president Edmond H. Leavey and Farnsworth president L. G. Haggerty.

The new plant, to be finished next spring, will be the division's third in Fort Wayne and its fourth in Indiana. Its 160,000 sq ft of production space will employ 1,500.

Telectro Industries Expands

EXPANDING into a 50,000-sq ft plant in Long Island City, N. Y., Telectro Industries steps up engineering and production of multichannel magnetic recording equipment. Telectro makes both industrial and studio gear.

Nucleus of the new plant is an enlarged research and engineering facility, backed up by expanded engineering design department and specialized production groups. Telectro still uses skilled handworkers (picture) for a good deal of its assembly work.

Facilities in the new quarters include a machine shop equipped to handle precision production and fabrication of intricate mechanisms, and enlarged testing labs.

Founders Harry Sussman and Stanley Rosenberg head the firm. Sussman is Telectro's president and director of engineering, and Rosenberg is secretary-treasurer and general manager.

Beckman Spinco to Expand

BECKMAN Instruments has leased 12 more acres in Stanford Industrial Park, Palo Alto, Calif., to expand its Spinco division plant. The Spinco division manufacturers special instruments for medical research.

The new addition increases Spinco holdings to 17½ acres. Present plant on the site is a 40,000-sq ft building, completed early this year, which houses 110 employees. Plans for expanding this plant will be announced soon.

Fire-Struck Firm Bounces Back

STRUGGLING to recover from a July 18 fire that destroyed engineering and production facilities, Electro-Measurements Inc., Portland, Ore., is already approaching full employment and production levels. The fire-gutted plant is being rebuilt, and will probably be ready to roll in about a month.

Head office of the firm is in downtown Portland, was not affected by the fire. Within three days after the plant burned, presi-

BUSINESS MEETINGS

Oct. 7-9: National Electronics Conference, Hotel Sherman, Chicago.

Oct. 7-9: International Systems Meeting, Hotel Statler, Los Angeles.

Oct. 21-25: 45th Annual Safety Congress. Sessions on industrial safety at Hotel Conrad Hilton, Chicago.

dent Douglas G. Strain had relocated all the firm's operating units in temporary quarters, and limited production had been resumed.

Plant Briefs

OUT in Canoga Park, Calif., **Elgin National Watch** is putting up a 20,000-sq ft R&D center for its Micronics division. Plant will concentrate on applying precision watchmaking techniques to miniaturized missile and aircraft gear.

Raytheon adds 20,000 sq ft to its research lab in the former Assabet Mills, Maynard, Mass. New space will be devoted to airborne gear.

Executive Moves

EXPORT expert **Robert L. Feistel** moves into Budelman Radio Corp., Stamford, Conn., communications firm, as general sales manager in charge of both domestic and export sales.

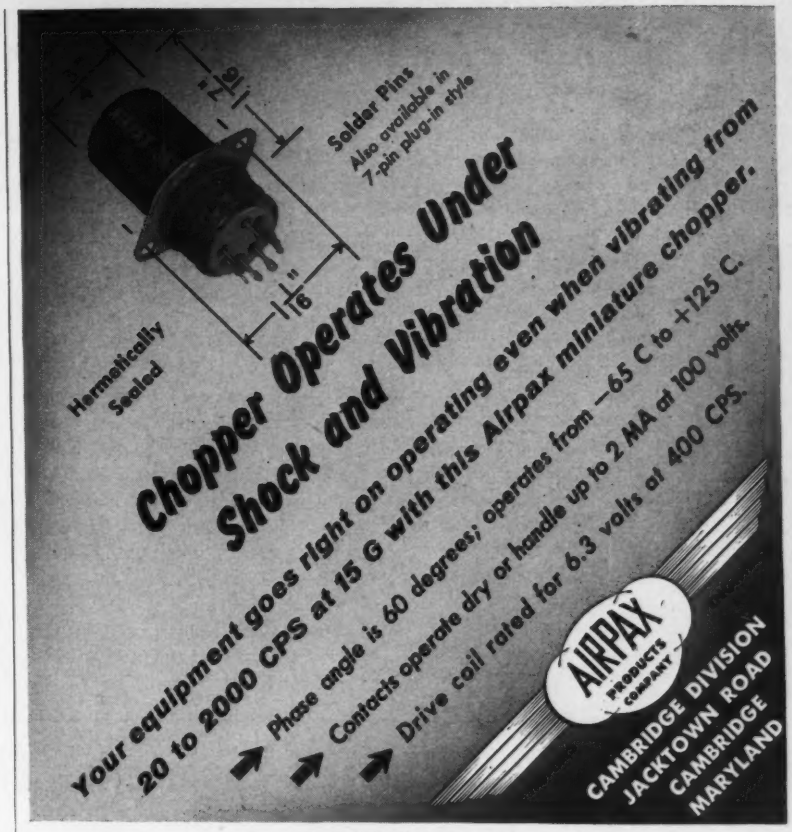
Clevite Corp. calls **Wilbur D. Prescott** home from Canada, where he was president of Clevite Ltd., to put him on central staff. **William H. Martin** moves up to succeed Prescott.

Minneapolis - Honeywell moves **John R. Lenox** from its appliance controls division in Gardena, Calif., to make him operations v-p of subsidiary Datamatic Corp. Factory manager **Raymond S. Fries** succeeds to the general managership in Gardena.

Tracerlab Inc. moves **W. Harrison Faulkner, Jr.** up from chief engineer to general manager for engineering and development.

Borg-Warner International moves its fiscal expert, **Robert A. Brown,** into newly created slot of v-p and general sales manager.

Cledo Brunetti leaves General Mills, where he was director of engineering, and moves out west to Food Machinery & Chemical Corp. He becomes executive assistant to the exec v-p who manages FMC's ordnance division.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Reps Sell Power, Parts

POWER supplies and components remain important items in the catalogs and salesbooks of manufacturers' representatives.

Rectifier-maker Christie Electric gives **Frank W. Taylor** of DeWitt, N. Y., the upstate New York territory for its d-c power supplies.

Pasadena, Calif., rep firm **McCarthy Associates** will handle the power supply products of John Fluke Mfg. Co.

Condenser Products will sell its power supplies and components in metropolitan New York through **George Podeyn**, Great Neck, N. Y.

In the Los Angeles territory, **Robert G. Moye** gives up jobber representation for Astron components to **I. R. Stern & Co.**, will still handle the industrial trade.

New jobber reps for Radio Receptor's rectifiers and diodes are **Charles S. Polachek**, Milwaukee, Wis., in eastern Wisconsin, and **Jess Haskell**, Oak Park, Ill., for northern Illinois.

Manhasset, N. Y., rep firm **Wild Associates** now is sales and engineering rep for Epsco's data-processing gear, serving the New York-Philadelphia area.

Philco has five new reps for its paging equipment and itv systems: **Sol J. Levy**, Bradley Beach, N. J.; **Carl A. Stone Associates**, Los Angeles; **Foster Electronics**, Escanaba, Mich.; **Private Television Systems**, Indianapolis, and **Exec-U-Phone Systems**, Boston.

Peterson Co., Denver, takes on the digitalizers of Instrument Development Lab.

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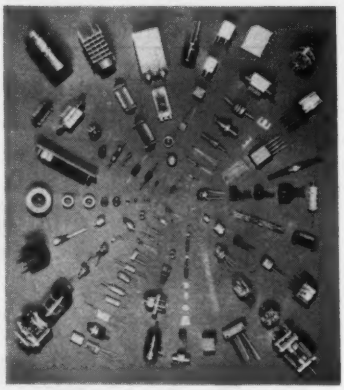
Coming in Our October 1 Engineering Edition . . .

• **Airwave Cops.** L. Day of the FCC shows how station compliance with FCC rules and regulations is checked by personnel in an air-conditioned truck completely equipped with tv signal-measuring instruments. This mobile facility fills reception range gaps not covered by regular monitoring stations. Its receiving system covers all channels. Unit features special i-f amplifier, pulse generator and color phase meter.

• **Slick Computer.** A system that automatically measures height and temperature of liquids stored in an 88-tank "farm" of the new Tidewater refinery at Delaware City is described by Gimpel and Barton of Panellit, Inc. Measurements on tanks ranging from about 2,000 to 200,000 barrels in capacity and 11 and 15 ft in height determine actual liquid volume for production and inventory control. Computing elements account for geometric oddities of individual tanks using data stored on magnetic tape. An error detector accounts for tape defects and recognizes only bit combinations corresponding to decimal digits.



"Miniaturization of Electronic Equipment," a Special Report appearing in our October 1 issue, discusses the huge variety of subminiature components representing the output of 56 manufacturers

• **Clipped Speech.** A radio-telephone network that connects isolated fur-trading posts located throughout northern Canada is described by Horner of Hudson's Bay Co. and Crosby and Coffman of Crosby Labs., Inc. Low-power ssb operation provides ideal communications between stations within 200 to 500-mile range. Thirty to 50-watt ssb peak-envelope-power transmitters pass traffic when 150 to 350-watt a-m system cannot. Design is geared for operation by nontechnical personnel located in remote posts.

• **Think Piece.** W. E. Osborne of Nevada Air Products tells how sensitive infrared detector circuits respond to minute temperature changes in head, or body, produced by emotion or deep thought. Technique using these circuits, has been applied to electroencephalography for study of the brain and as diagnostic detector for pin-pointing local inflammations in the body. Similar equipment, with positioning circuits, is being developed for aircraft collision warning.

• **Bopping Beepers.** An accessory for airborne radar fire control described by R. C. Barritt of Westinghouse Air Arm, presents radar-range information as audio signals, relieving radar-attack pilot's overcrowded visual field. A variable-frequency phase-shift oscillator beats out two different tones which indicate the impending firing range as plane flies the final mile to the target.